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MODEL AIRPLANE NEWS

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The STAGGERWING Story

HOT EZ CAP 21

Radio Control Action!

Build the THUNDERBOLT

HELICOPTER Champs

More POWER with a Tuned Pipe

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VOLUME 115, NUMBER 5 NOVEMBER 1987

MODEL AIRPLANE NEWS

ON THE COVER: Gracing this month's cover is the legendary Staggerwing Beechcraft, shot by aviation photo ace Budd Davisson (article on page 66). The pilot is Jim Gorham of Mansfield, Ohio, in his G17S photographed just south of Oshkosh, Wisconsin. Jim is part of a formation demonstration team and his Staggerwing will do 200 mph at 9,700 feet on 65% power. Also on the cover is the neat Thunderbolt being launched by an enthusiastic modeler (photo by Bob Cook) and an aerobatic CAP 21 (photo by Eric Meyers).

ABOVE: The U.S. team shows their trophies won in the Masters Tournament (article on page 42). From the left: Helms and Aurora, Hyde and Aurora, team manager Dave Brown, and Tony Frackowiak with Challenge IV.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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Editorial

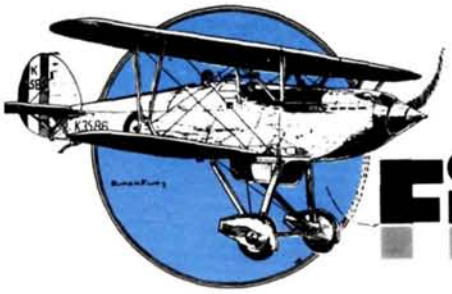
by RICH URAVITCH

THE MANY FACETS of our aeromodeling hobby seem to attract and absorb nearly everyone who wants to join our ranks. Indeed, many of us zero in on the one phase which interests us most and pretty much focus all of our modeling time (and money) in that arena. Some of you, no doubt, have recognized that "jumping around" to try different elements of R/C can be equally rewarding as you expand your interest.

One of the areas which seems to be drawing a lot of that interest is smaller airplanes. They're every bit as much fun, more convenient to transport, and unquestionably more economical. The Thunderbolt construction article in this issue typifies the breed. Right up there on the relaxed side of the flying ledger is the Lazy Bird converted to a motor glider, or the very efficient sport flyer, the Sunbird. The CAP 21 review represents one of the newest in the EZ ARF series. Some of you may have noticed that the ARFs are here and in a big way...so much so that we've got a "theme" issue coming up in which we'll review some new "kits" and present a mini buyer's guide which will help you get a handle on what's out there and make some comparisons before you buy.... There's a lot available and something for everyone.

Try a little diversion, something different from your normal project; expand your horizons...there's a huge untapped modeling world waiting out there. ■

In the June '87 issue of Model Airplane News *in the article entitled "Basics of Flight," we inadvertently omitted giving credit to Peter Chinn and Model & Allied Publications Limited (now Argus Books) for the use of material, photographs, and drawings from Mr Chinn's book,* All About Model Aircraft. *We would like to extend our apologies.*



Fifty Years Ago...

by ART SCHROEDER

BY NOVEMBER 1937, the excitement of the Nationals had subsided and *M.A.N.* had returned to its normal coverage of the modeling and full-scale scene.

Big modeling news was the coverage of 1937's Wakefield event. This was modeling's premier event in those days. It was rubber-powered and the competition was intense.

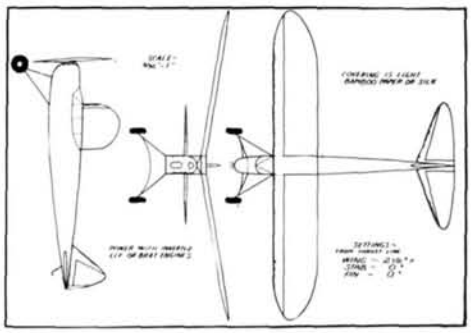
The event was held near London with most travel by the competitors, from eleven countries, by ship—quite a contrast to today's travel for international events when one is in New York on Monday and Europe on Tuesday. Travel to the 1937 event took up to five days or so for the Americans.

In any event, the 1937 Wakefield was won by E. Fillon of France with a time of 253.23. I guess that was seconds. It appears, if 1937's international events were scored by today's standards, that France would have won, as well, as a team, but not by much over Great Britian. An interesting quality to international events in those days was the fact that competing nations could send more than the three fliers that are normal fifty years later—France, Great Britian, and Germany sent six fliers in 1937, followed by America's, Holland's and Sweden's five.

War was already a major fact in the day's news, with the Chinese/Japanese war in full force. A feature article by Fletcher Pratt tried to compare the air forces of the two warring nations. There is no question that we were, at this time, learning how the airplane could be best used as a weapon. Little did we know that, very shortly, we would learn a lot more than we really wanted to know.

In the ads, Berkeley announced what has been, perhaps, the most beautiful gas model of all time. This was the Custom Cavalier designed by Ben Shereshaw. At a $15 price, it was the most impressive machine with its 9-foot wing that one could fly. The Cavalier went on to be a test bed for many early R/C experimentors.

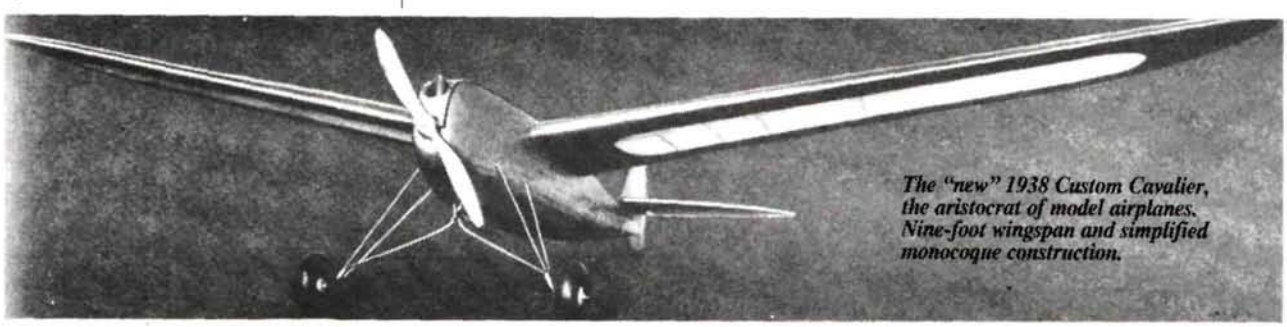
Emanuel Fillon of France, winner of the International contest and Wakefield Cup.



Three-view of Pee Wee gas model for inverted Elf or Brat engine. Wing had 275 square inches of area.

Featured in this issue was a Pee Wee gas model by Malcolm Abzug and Richard Wachtell. This Elf-engine-powered cabin design was an answer to the relatively huge gas models typical to the 1937 era. The article underscored the "name" problem of 1937. It was called "Pee Wee" by the editors of *Model Airplane News,* but it was called "Shrimpo" by the authors. In any event, the 44½-inch-wingspan airplane would make a fine .049-powered airplane today.

It was an issue chock full of model aviation's current happenings with speed jobs, duration facts, news, and full-scale aviation. In short it was *Model Airplane News* doing the job it has done for all these years! ■



The "new" 1938 Custom Cavalier, the aristocrat of model airplanes. Nine-foot wingspan and simplified monocoque construction.

Airwaves

Full of "Hot Air"?

I'm writing to inform you of what I believe to be the first flight of a model airplane (or of any heavier-than-air craft) powered by a Stirling "hot air" engine. The Stirling is an external combustion engine characterized by having no valves and two pistons in the same cylinder. A displacer piston alternately moves an enclosed volume of air back and forth between the hot and cold ends of the engine. The resulting pressure variation delivers useful power to the other piston, which turns the output shaft.

The airplane is a modified Astro Flight kit, the "Super Malibu." Total weight of the craft (including a two-channel Cannon radio, rudder, and elevator) is 36 ounces. The engine, tank, and propeller weigh 13.6 ounces. The tank holds 10 grams of propane, enough for seven minutes of flight. The prop is a 12x8 Master Airscrew folder.

The first flight was made in Redmond, Washington, on June 24, 1987, and lasted about 50 seconds. The airplane gained about 75 feet of altitude. The craft was brought down (suffering minor damage in the process) when it was noted that the engine was pulling loose from its mount. Nevertheless, the flight is considered a great success. Further flights are planned for the near future.

The engine was designed and built by myself at the New Machine Co. of Kirkland, Washington, culminating several years of developmental effort. The ring of tubes about halfway down the length of the engine is the cold heat exchanger.

ROB McCONAGHY
Kirkland, Washington

Keep us posted on any new developments. By the way, how 'bout some "flight" shots? LVD

Out in the Rough

I've hung up my goggles and scarf after 33 years of flying in various parts of the world. Since aviation is a constant interest to me, I got the urge to get into radio-controlled models during January 1987, but was out by July '87. There's no place suitable to fly a seven-channel quarter-scale. As for the two clubs in the area, one required membership in several organizations and a "loyalty oath and security check" attitude. The other club had a nice strip, but it was on top of "Mt. Olympus," and had a long waiting list. I opted to drive 95 miles to the desert, where I crashed the Super Cub three times hitting sage bushes!

The lack of flying sites appears to be a major problem to the modeler. If model shops and catalog sales hope to survive in the long run, someone should come up with a national plan to find potential flying sites; a plan that would not force the membership into such strict compliance to regulations in order to protect their sites.

JACK HAMBLIN
San Diego, California

Jack, the loss of flying sites is a very real problem. The likely reason for the "loyalty oath" and "security check" attitude you experienced was no doubt in part due to the memberships' interest in preserving their flying site. If regulation is what it takes, like defined hours of operation to support noise abatement, safety checks, required testing program, and improved requirements to preserve a club site; you can bet that's what you'll experience!

Who should that "someone" be to come up with a "national plan"? Resolving local problems seems more important. If you're volunteering, a lot of your fellow modelers should be eager to support your effort. If not, how much do you want for that "seven-channel quarter-scale"? RU

AM or FM?

I've recently been looking around for the best price on an R/C transmitter. I've noticed that now there are both AM and FM transmitters, but I'm not sure which to purchase. Should I get an AM transmitter and let it be subject to outside interference just because it's lower in price, or should I buy an FM to better protect my flying investment? There's a lot of lightning (which creates interference) in the state of Florida. What do you suggest?

ALAN T. ZAK
Gainesville, Florida

Alan, your first sentence indicates that you're looking for the best price. If that's the objective, you've answered your own question. I've always felt a radio is a good radio as long as it's working. The new, narrow-band FM sets, while improved, don't guarantee immunity from outside interference. Nothing does, not even the higher-priced PCM sets. That boils it down to reducing the probability, which the FM seems to do slightly better than AM.

Interference is a problem that's not necessarily resolved by money. If peace of mind is derived from paying more money for a system, then buy it. I certainly want as much POM as I can have when I'm getting ready to launch my newest airplane—especially when it involves many hours of building, finishing, and installing.

Your last question is easy...don't fly in the vicinity of lightning...stay indoors and build! RU

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

TURNS

Basics of Radio Control

by RANDY RANDOLPH

THE ONLY reason for the existence of radio-controlled airplanes is to fly! This column has been remiss in that department so, in the words of a famous weather forecaster, "things are fixing to change."

The following lines are intended for those who have not been able, as yet, to secure a competent instructor and complete a satisfactory solo flight. This is not intended as a flying course, but rather as an outline of the stick inputs necessary to control the basic attitudes of the aircraft. Only two controls will be considered, the elevator for attitude and the rudder for heading. We'll also assume that both of these controls are on the same stick.

This discussion will consider rudder and elevator movements from the transmitter's right-hand control stick. It should be understood that the same movements produce the same effect on the flight of the aircraft should ailerons replace the rudder in this configuration and providing the airplane has lots of dihedral.

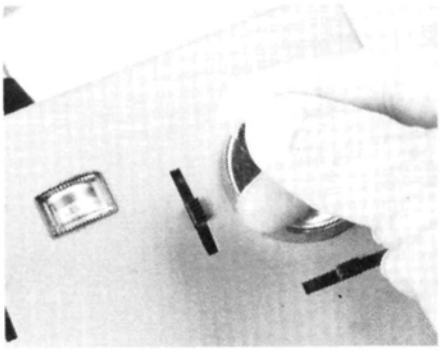
The surfaces on the airplane must correspond to the movement of the stick in this manner: when the stick is moved to the left, the trailing edge of the rudder also moves to the left. When the stick is moved to the right, the trailing edge of the rudder moves to the right. Pushing the stick forward (away from you) should cause the trailing edge of the elevator to move down: pulling the stick back toward you should move the trailing edge of the elevator up.

It follows that if the stick is moved to the back left corner, the rudder should move to the left and the elevator move up. Because the stick can be moved in a complete circle, all combinations of rudder and elevator movement, as well as the amount of movement, can be obtained.

In flight, the elevator controls the angle of attack of the wing. When the stick is moved back, the nose of the airplane goes up and the airplane climbs because the wing generates more lift at the higher angle of attack. There is a price to pay for this additional lift and it costs some airspeed.

When the stick is moved to the left, the combination of the left rudder and the dihedral in the wing causes the airplane to enter a bank to the left. If the rudder is held, the airplane will continue to bank until it enters a left-hand spiral dive. The airplane dives because when the wing is slanted toward the ground the lift generated by the wing is no longer against gravity but at some other angle to the ground. Therefore, during all turns more lift is necessary to maintain level flight. This lift is generated by moving the stick back to get up-elevator, increasing the angle of attack of the wing. This slows the aircraft the same as in a climb, so you can see that an airplane can stall in a turn the same as in a climb.

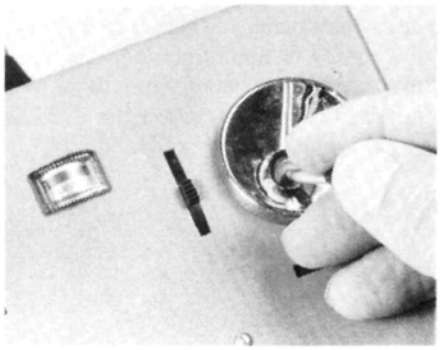
To perform a smooth left turn without loss of altitude the following stick movements are made. First it is moved to the left and, once the bank angle is established, it is allowed to return to center. At the same time it is pulled back to increase lift and maintain altitude. At the comple-



1. These three pics show stick sequence to complete a left turn. First, the stick is moved left to cause proper bank angle.

tion of the turn the stick is moved to the right until the wings are again level and at the same time the stick is moved back to the center because the extra lift is no longer needed.

During a turn the stick actually follows a semi-circle which goes from the center to the left, then back, and finally around to the right before returning to the center. A right-hand turn is performed in the same manner, but started to the right and ended from the left back to center. Full-range movement of the stick is not generally necessary, because the proper bank angle and elevator movement are

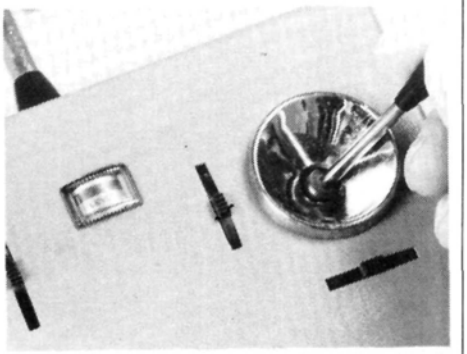


2. Once the bank angle is established, the stick is moved back to provide necessary up-elevator to avoid a dive.

usually obtained with much less than full deflection of the stick.

Straight flight requires only occasional control inputs to correct heading differences caused by air currents. These inputs are simply done by small movements of the stick to left or right as the situation demands. Corrections made when the aircraft is flying directly toward you can be confusing unless you remember to "move that stick to that low wing to control that thing."

Hopefully this discussion will make it a little easier to understand what effect the movement of the stick has on the flight of



3. Finally the stick is moved to the right to level the wings. Once leveled, the stick is centered.

the airplane. The airplane already knows how to fly, the trick is to *make* it fly where you want it to fly! It is relatively easy to learn and, once learned, is never forgotten.

In passing, a flight school for R/C aircraft has been started. For more information write to the 1st U.S. R/C Flight School, 521 S. Sawyer, Shawano, WI 54166.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

Golden Age of

by HAL "PAPPY" deBOLT

CHARLIE REED can be properly called an R/C pioneer; he's also the current editor of the Kansas City KC/RC *Contacts* newsletter. In the May '87 issue, Charlie had an article which surely fits the "Golden Age" format. The article includes bits of information from the November '65 issue of *Contacts.*

Twenty-two years ago, Charlie was president of KC/RC, Courtney Smith was vice president, and Bud Atkinson was secretary/treasurer. At the time, there were no 72 MHz frequencies, and only six spots on the 27 MHz band. The AMA had just petitioned the FCC for the 72 MHz allocation.

Maynard Hill had just established his first R/C altitude record at 13,328 feet. Bill Northrup eclipsed it with 16,690 feet, using his Foo-Too model. At the time, Bill used one of Don Brown's D-B 21 proportional radios. A glider had set a 23 mph speed record over a 50-meter course, using a Sampey 404 propo system. Wonder what the reaction would have been had someone suggested that a glider would eventually set the R/C speed record at nearly 250 mph?

Here is Claude McCullough's Boxcar design of the '50s. Has a 1,300-square inch wing, Anderson .65 power, and Babcock pulse R/C system. Weight 9 pounds. We'd say things have changed.

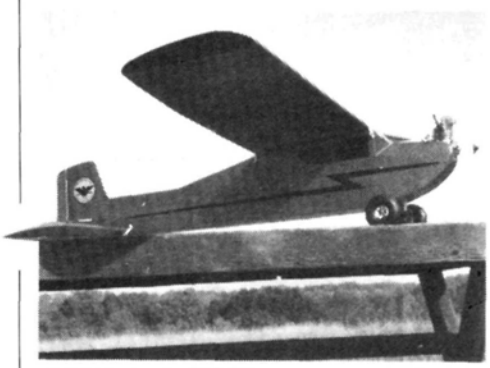
Wide World of Sports announced a December showing of the '65 Nats action. Featured were Cliff Wierick and myself in a pattern duel. Cliff won with a flight that came within 2 points of perfect.

Do you remember those very early Sunday flying sessions. Note the Rockwood-style transmitter and hay-field flying site.

Gary Leonard had joined Wing Manufacturing in Chicago; Carl Lindsey offered a used F&M 12-channel reed system for $225 (that's 1965 dollars!); the Lomar, Missouri, club held a fun-fly with just 20 entrants; and Bud Atkinson thrilled onlookers with repeated low-level, inverted passes, using his new Logictrol radio. Items for sale included a 10-channel reed system for $75; a Marcytone system for $75; a "like-new" S.T. .56 engine for $20; and a Digimite propo system with 8 servos for $450 (the retail price was about $750). How sweet it is today!

The annual club dinner was held on New Year's Day. The happy announcement was that the club would have a county-provided flying field! Apparently, the first effort was quite confined, but over the 22 years it has grown into a well-used, park-like atmosphere.

We'll watch future *Contacts* issues for more OT R/C information. Are there any other newsletters which feature early R/C info? Your author believes there may be; we'd all benefit from them. Why not send your club's newsletter to *Model Airplane News* in care of Hal deBolt?



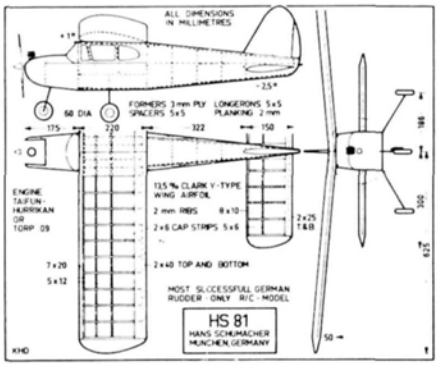
L.W. Senior by Bill Weaver serves as engine test bed, here with an O.S. FS 40 four-stroke.

In the last two editions of "Golden Age," I covered the first FAI R/C World Championship, which established the precedent for all that followed. If you recall, as a result of that championship, the American team went on a month-long demonstration tour of Germany, which included the German National Championship. The opportunity to see what R/C was like in Europe, and, in turn, to show them the best of American R/C, was a fantastic experience. Before the championship, there had been very little R/C communication between other countries.

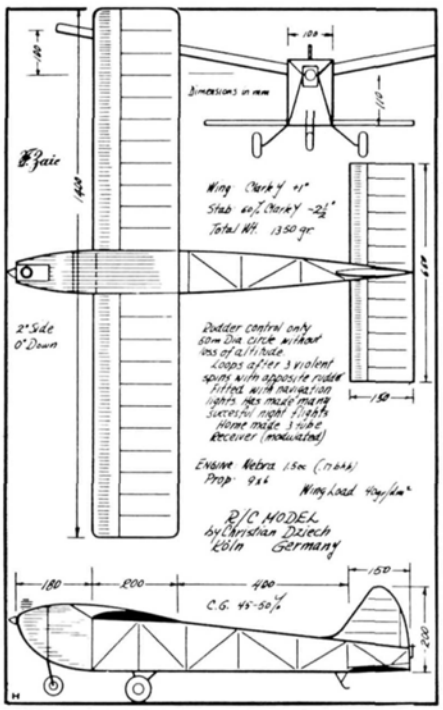
The team's adventure began with a short flight to Stuttgart, Germany, and the Graupner factory. In those days, Graupner was claimed to be the world's largest model enterprise.

The Graupner operation was a combination of manufacturing and distribution of other companies' products. The facility was an amalgam of old buildings with various materials arranged in a haphazard fashion. A vast supply of balsa was stored in open-front sheds outside the factory. We wondered about the effect of the weather on it. Johannes was quick to apologize for the disarray and was happy to inform us about a much larger, more modern factory that was being planned. The new facility became one of the finest model factories ever built.

Weaver's '52 vintage L.W. trainer, now with electric power, still looks like new.



1960 German Nats entry by Hans Schumacher. Hans was a German radio manufacturer.



Typical '60s German Nats entry by Chris Dziech of Koln. European designs were not as advanced compared to American styles of that day.

We left Stuttgart for Frankfurt, where the German Aero Club transported us to the German Nats, in Kassel. With three huge model boxes in a Volkswagen minibus, there was little room for five people!

The field at Kassel had been a major Focke Wulf manufacturing plant during WW II. Now (16 years later), it was an ideal flying site!

A description of the German Nats could be a junior version of an early AMA Nats. What was different was the predominance of free-flight, with a very small amount of C/L and R/C. For example, the R/C event was completed in less than one day! That's not to say there was a shortage of flying; models of all kinds filled the skies from dawn to dusk every day.

A marvel to us all was the day when the sky was filled with flying wings of all descriptions; such finesse of flight is difficult to describe. The Germans have a special category for tailless models. To the uninitiated, the grace, stability, and duration that was demonstrated by these unusual designs was amazing. We were fascinated all day—this was modeling like we had never seen in America.

Genial Cliff Wierick was an early associate of Howard Bonner, later with Phil Kraft, and is now with Airtronics.

Today, it's interesting to read in the soaring columns the results of international "postal" contests. A German flying wing club has dominated the standings for several years: is this a message?

At this Nats, the spectators were numerous and all activity was shut down

(Continued on page 106)

How To:

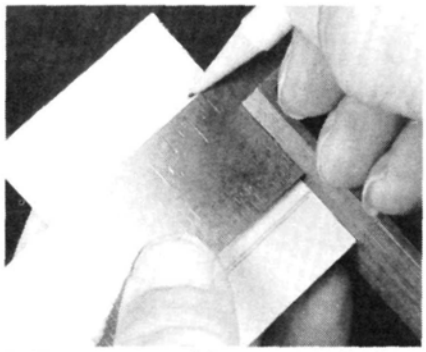
by RANDY RANDOLPH

INSTALL BLIND NUTS

Blind nuts, or T-nuts as they are also called, are the best way to anchor engine-mounting bolts to a plywood firewall. To do their job they must be properly attached to the back side of the firewall. These photos show the way.

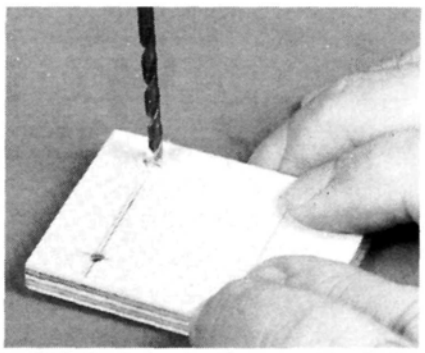
1. The tools and materials needed include the blind nuts, two sizes of drills, an engine mount, mounting bolts, a square, a pencil, and the firewall. Not shown but also required is some cyanoacrylate or epoxy cement.

2. Measure the location of the mounting bolt holes in the engine mount. Measure from the corresponding **edges** of the holes rather than from the centers; in this case the holes are $1\frac{3}{16}$ inches apart.

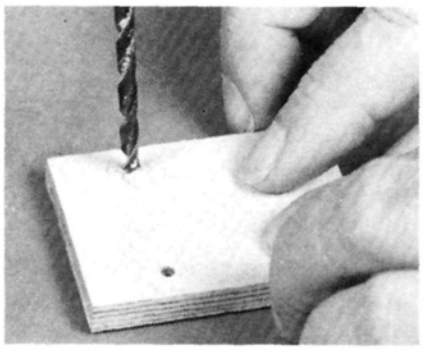


3. Use a square and draw two parallel lines on the firewall. These lines will locate the position of the mounting bolts and should be spaced the same as the distance between vertical holes in the mount.

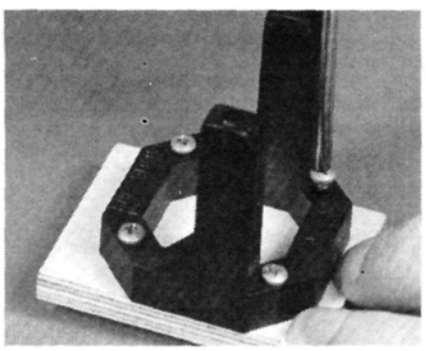
4. Measure and mark the distance between the horizontal mounting holes on the two drawn lines. Check centering by measuring from the edges of the firewall.



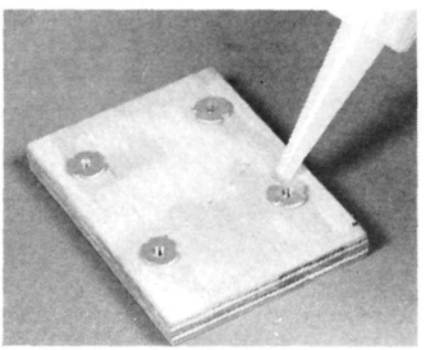
5. Drill the holes for the mounting bolts. These holes should match the size of the bolts; in this case $\frac{7}{64}$ inch for 4-40 bolts.



6. Counter-drill the **back** of the firewall to fit the outside diameter of the neck on the blind nuts; $\frac{9}{64}$ in this case. Drill only deep enough to fit the neck, **not** all the way through.



7. With the blind nuts on the back side of the firewall, bolt the mount tightly in place. Tighten the bolts to seat the blind nuts flush with the back of the firewall.



8. Apply epoxy or one of the instant glues around the blind nuts. Use care and try to keep glue out of the threads. Should some get on the threads, it can usually be removed by running a bolt through the nut several times.

UMP TANGO

by REED KALISHER

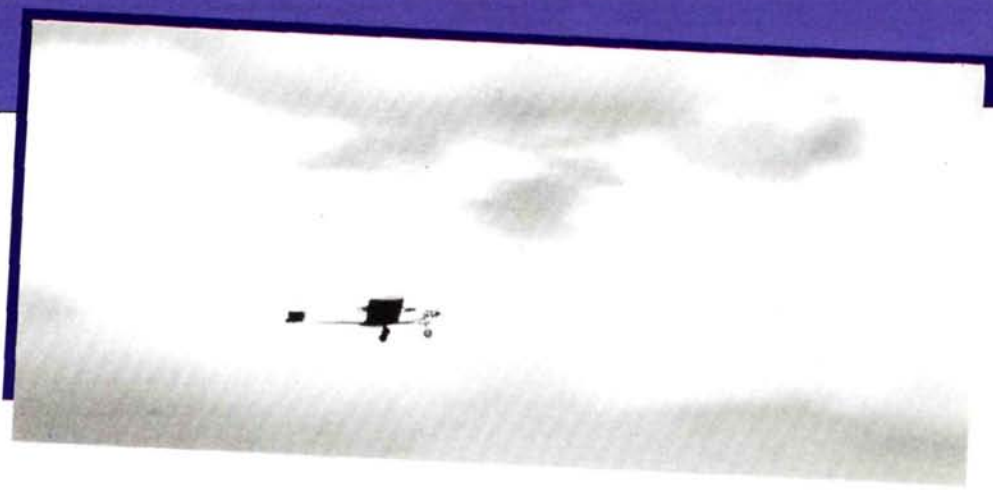
This sport plane features a Duraflex fuselage, the toughest stuff we've come across yet.

MY JOB DOESN'T leave me a lot of time for building these days, so I've developed a fondness for almost-ready-to-fly aircraft. My only objection to ARFs has been that to get the quality I'm used to from building my own models, I had to cough up some big bucks.

Please notice my deliberate use of the past tense "had!" United Model Products* now imports a line of ARFs by an Italian manufacturer, Aviomodelli. The quality of their kits is superb, and I had the distinct pleasure of building their Tango.

The Tango is a mid-wing sport plane, with a 59-inch wingspan, a dry weight of about 5 pounds, and an engine requirement of a .25 to .40 two-stroke. If you've seen the advertisements in *M.A.N.* for this plane, you might have noticed that less of the plane is completed than on most other ARFs, leading me to dub this one a "NARF" ("nearly" almost ready to fly!). There are other differences, too, so let's get into the meat of this review.

THE KIT. When you first open the box, you're immediately struck by the unusual wings and fuselage. The wings are foam core covered with a thin sheeting of obechi, a very durable and easily sanded light wood. The next thing to reach out and grab you is the fuselage, made of super tough Duraflex composite plastic. The molding was very precise, as the seams were almost undetectable and there's no flash at all.



SPECIFICATIONS

Type: *Sport*
Wingspan: *59 inches*
Engine: *.35 to .45*
Weight: *5 to 5½ pounds*

The horizontal stab is a foam-core, obechi-covered Hershy bar, and the vertical stab, rudder, and elevator are the only balsa parts in the entire kit.

The hardware is a little out of the ordinary as well. The linkages are torque tubes (except for the rudder) made out of aluminum. The landing gear is made from a durable plastic, as is the nose gear, which is a forked prong.

There were a few "boos" awarded, but they are minor. The biggest problem I encountered was the relationship between the engine choice, firewall, and the engine mount provided. The kit specifications call for a two-stroke .25 to .40, but the engine mount will accept only the smallest of the .40-size engines. The instructions tell you to "trim" the mount to make a larger engine fit. In some cases you'll have to chose some other mount to fit certain engines.

The instruction manual is written in four languages: Italian, French, English, and German. The English translation still has quite a language barrier. I used the manual exclusively for the order of construction and leaned on the excellent full-size plan as to the "how." It would be a nice addition if UMP would add a re-translation to the kit. However, because the parts fit on what little construction there is is so good and the plans are so clear, there are no real hang-ups. Okay, let's move on.

CONSTRUCTION. The first decision I had to make was to paint or cover. I opted for both! Since the fuselage has some compound curves, I chose to paint it and use a matching (nearly) covering for the wings.

To paint the Duraflex fuselage, I first had to wet-sand

O.S. FP 35 with remote needle valve makes for safer high-end adjustments.

With access cover removed, wing assembly via screw-lock clamp and spar tube is simple.

it with a 240-grit flint paper. This is a *must*, or the paint will not adhere. I suspended the fuselage and applied light coats of Coverite's* Black Baron epoxy to obtain an even color with no runs. After the epoxy was fully set (24 hours), I applied the trim and sealed it with a coat of clear.

The wings can be painted or covered. If you paint, be sure to fill the grain and put a coat of primer on the sanded obechi prior to the color. If you don't, the grain will show through. I chose to use a Black Baron covering that was keyed to match the epoxy. It didn't! I

(Continued on page 90)

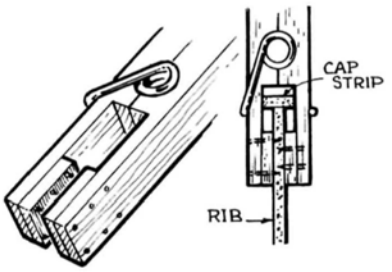
Hints & Kinks

by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

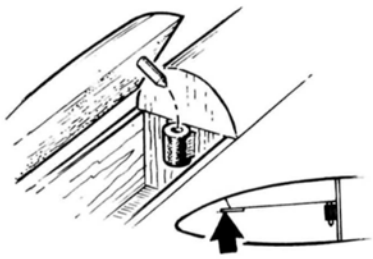
Threaded-wire pushrods can be difficult to screw into those flexible nylon pushrods. (I notice they now call them "snakes" across the Atlantic.) You could bend an L in the end of the wire or use pliers, which scars the material. Why not simply fasten a suitable wheel collar to the wire to give your fingers something to grip?

Gordon Banks, Huntsville, Alabama



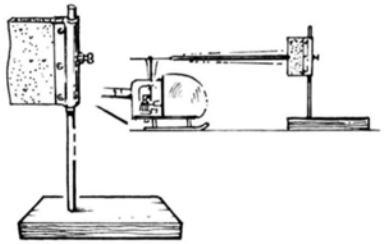
The common clothespin can be converted into a useful little clamping device that will not only hold capstrips in contact with the ribs but will also center it on the rib ready for gluing. Note how the jaws of the clothespin have been cut parallel and appropriate thickness spacers glued to the inside faces. Small pins or brads in the jaws grip the sides of the rib. These are important to the function of the clamp. In the right-hand drawing, the clamp is shown lifted slightly for clarity. Actually, it would be in firm contact with the top of the capstrip. It might be worth waxing the inside faces of the clamp against glue.

Ralph Pearson, Falconer, New York



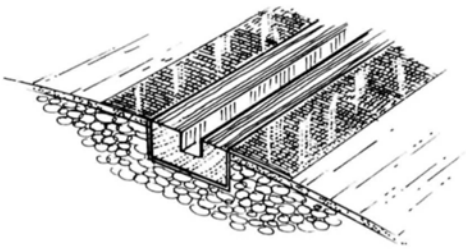
This is a friction-fit hatch hold down that, according to its originator, has never yet lost a hatch for him. The thick-walled rubber tubing supplied with Sullivan nylon pushrods (or the equivalent from an auto parts store), can be glued to the fuselage former as shown. A suitable-size dowel in the underside of the hatch just plugs into the rubber tube while the forward end of the hatch can be retained by the usual tongue or pin (arrowed). It's called The Ultimate Attachment. One can only admire its effectiveness and simplicity.

Raphael Boguslav, Newport, Rhode Island



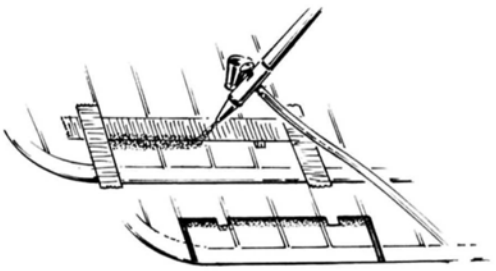
The flag on the stand is made from foam rubber underlay for carpets. This gadget is used to check the tracking of helicopter rotor blades to see if one blade is flying higher than the other. Your columnist has done this on real choppers by putting a different color chalk on each rotor tip then allowing the spinning blades to just wipe the flag to leave tell-tale chalk marks. Use CARE when using this device; be sure your copter is well staked down, and have a helper on hand, just in case! The flag is adjustable for height as a convenience.

George Kanakos, Willimantic, Connecticut



Cut your slot for the landing gear block a little oversize, line it with 1-ounce glass cloth and epoxy resin then, while the resin is wet, press in the epoxy-coated gear block. With the glass cloth bonded to the balsa sheeting, this a superb method of spreading the landing gear stresses out into the balsa wing skins, instead of localizing them along two narrow glue lines along which cracks inevitably appear.

Dale Nicholls, Clayton, Victoria, Australia



If you have a simple two- or three-channel scale model without ailerons, here's a great way to easily simulate ailerons. Apply masking tape as shown, then airbrush a shadow line along the tape. Remove the tape and then draw a couple of ink lines at each end. The result is a convincing aileron that passes all but the closest of inspections.

Dennis Bryant, Burgess Hill, W. Sussex, England

Construction

THE THUNDERBOLT

by BOB COOK

THE THUNDERBOLT is a small airplane with a small engine, but don't let that fool you: it's not just another docile trainer. This fast, highly maneuverable ship finally lays to rest the misconception that it takes a .60-size plane to deliver good performance. Suitable for aerobatics, combat, or racing, the Thunderbolt is most of all just plain fun.

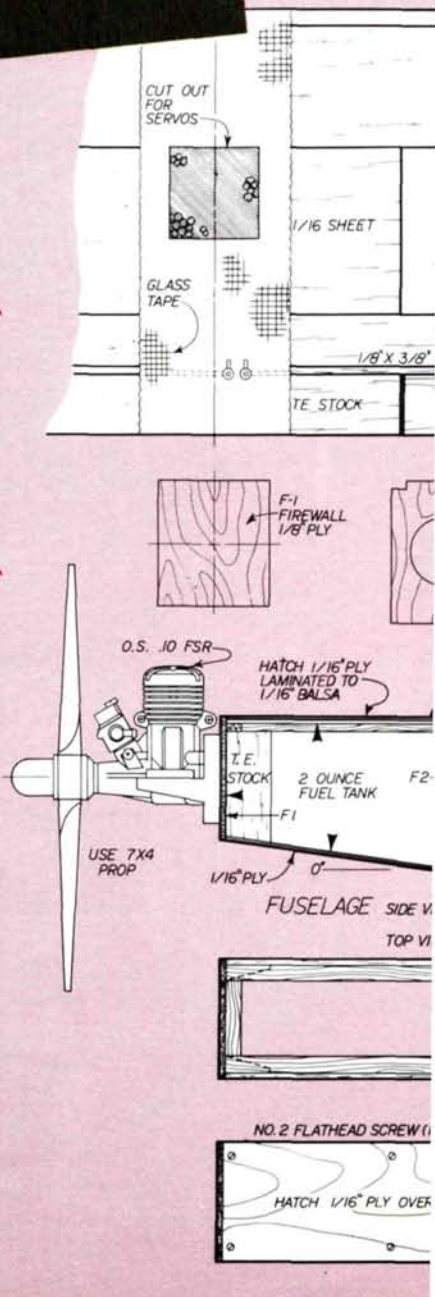
The heart of the design is the engine, the O.S. 10 FSR; it puts out tremendous power and is extremely reliable. Only a few ounces of fuel are required for each flight, so it doesn't cost a fortune to fly.

One of the secrets of the Thunderbolt's blazing performance is its low flying weight (about 24 ounces). This is achieved by keeping the structure down to a bare minimum, employing such features as a sheeted-foam wing which is permanently attached. Further weight is saved by the use of a micro radio system, and the lack of any extras such as landing gear.

The plane is quite clean aerodynamically with its narrow cross section. The airfoil is asymmetrical and well-suited for both aerobatics and high-speed flight. Without landing gear, these features keep drag down to a minimum.

The Thunderbolt is super-easy to build and inexpensive to complete. This is an important consideration for a plane which is intended for such "dangerous" events as pylon racing or combat flying. You certainly don't want to waste a lot of time and money in a plane which could be instantly rekitted! The simple box-type fuselage, foam wing, and low parts count make it possible

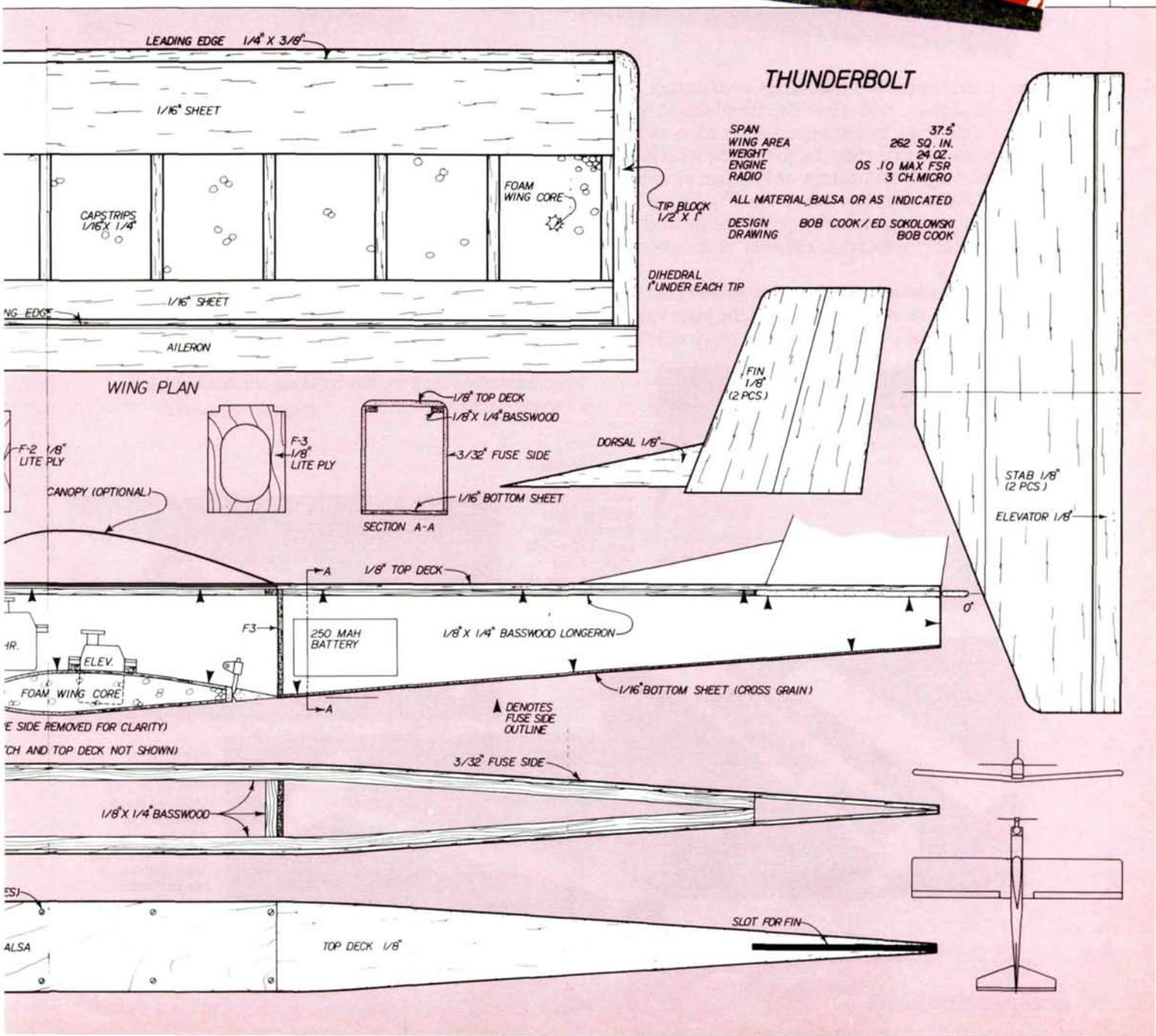
FOR ORDERING INFORMATION, SEE PAGES 120, 121

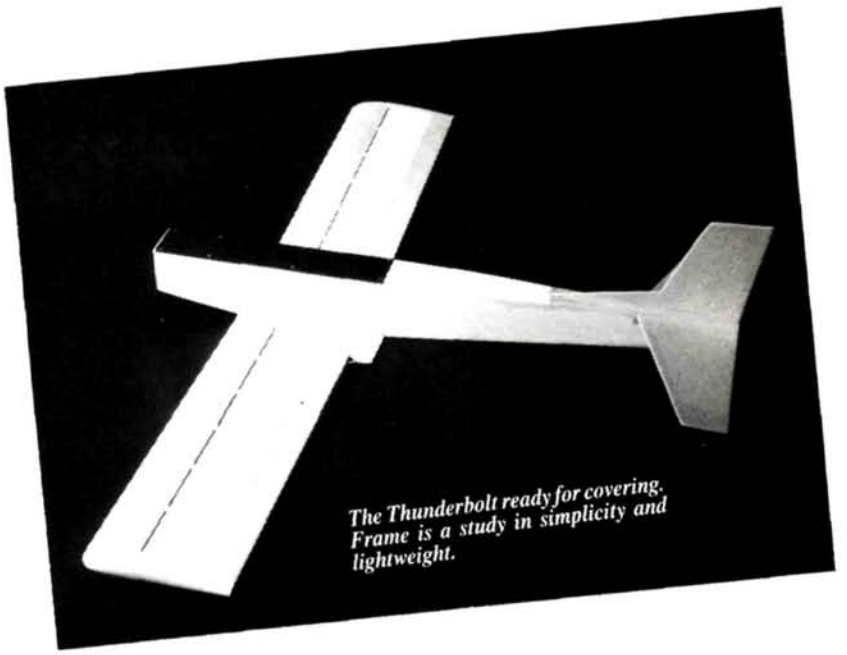


to build the Thunderbolt in only a couple of evenings. And those of you with a small workspace or limited storage will appreciate the plane's small size

CONSTRUCTION. Building the Thunderbolt is really easy and the structure is conventional, except for the hatch area. The plan sheet should supply all of the information you'll need, however, I'll briefly cover a few areas that may need clarification.

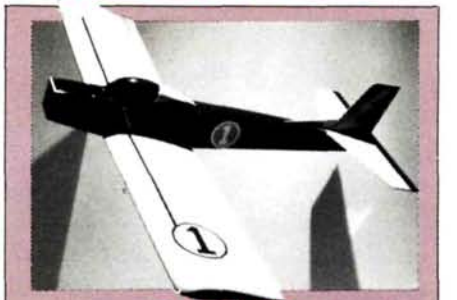
A word about adhesives—be sure to use appropriate glue for each application. The wing





The Thunderbolt ready for covering. Frame is a study in simplicity and lightweight.

Order the Full-Size Plan!



#11871 THUNDERBOLT $9.50

The 3-channel Thunderbolt is a .10-powered sport pattern ship with all the performance and aerobatic qualities of a much larger model. The 37.5-inch span model is perfect for club pylon racing and combat events due to its simple construction and low cost. Thunderbolt's 24-ounce weight gives super vertical performance with .10 glow power. Wing area is 262 square inches.

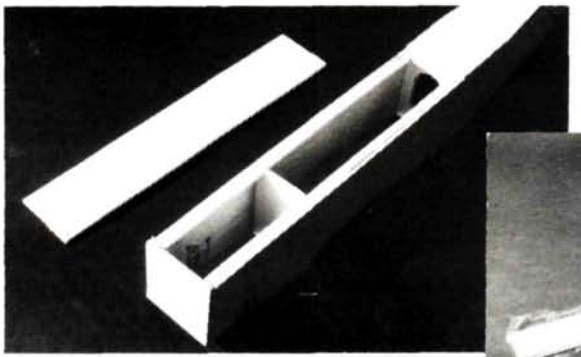
sheeting should be applied with *water-based* contact cement. An aliphatic-resin glue (Tite-Bond) should be used on the capstrips, leading edge, trailing edge, and tip blocks. Use *slow-setting* epoxy for joining the wing halves, bonding the wing to the fuselage, and for fuel-proofing. Do not use 5-minute epoxy, since it doesn't offer the necessary fuel- or water-proofing properties. In order to save weight, use cyanoacrylate adhesive for the wooden parts.

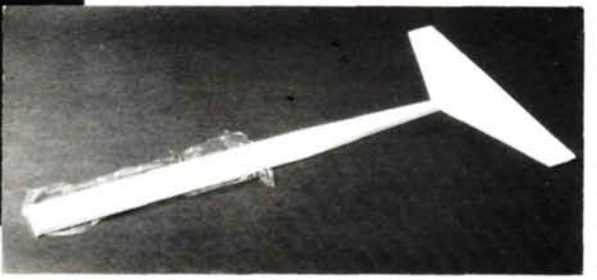
For wing construction, use the airfoil section from the plan and make a set of templates to cut the foam wing cores (there are many commercial firms which offer this service). Follow the plan drawing to locate the position of the sheeting, capstrips, and other wing parts. The wing halves are joined together with 1-inch dihedral under each wing tip.

For the tail surface construction, simply cut the parts for the tail surfaces from balsa sheet and set them aside for assembly later on. The fuselage is built upside down on the building board. First, laminate the balsa and ply hatch parts together. Drill holes in 10 places through both the hatch and the basswood longerons for the hatch hold-down screws. The holes in the hatch are countersunk to accommodate flat-head screws. Place a sheet of waxed paper between the hatch and the longerons (to prevent accidentally gluing the hatch during construction) and screw them together.

(Continued on page 115)

Left: Sheeting and cap strips with leading and trailing edges taped on foam core. Below left: Access cover attaches with six screws.





Above: Wing panels are blocked up and weighted down to insure proper dihedral during gluing. Left: Top sheet and stab in place. Plastic wrap protects plans.

Sporty Scale Techn

by RICH URAVITCH

Weight-saving, realistic, aluminum finishes.

Jet Hangar Hobbies F-86 given full aluminum panel and flush rivet treatment, using burnished chrome MonoKote.

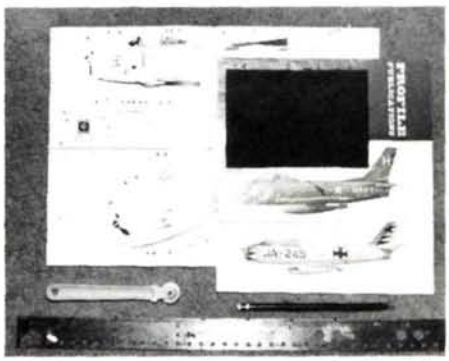
SOMETIME during the course of your Sport Scale involvement, you'll undoubtedly be confronted with the problem of finishing your model in a natural aluminum scheme. Most of us (especially those of us who prefer military subjects) work neatly around the problem by searching our documentation sources for something other than a silver-finished airplane. This approach frequently works, but is just as frequently a compromise, since the airplane we really wanted to duplicate was silver.

Sure, there are many ways to do it, and plenty of silver or aluminum paints: epoxies, lacquers, and enamels. But most of these (at least those I've tried) are lacking in one of two areas: either they don't look like alcald, or if they do, when you shoot on the protective clear coat, they "gray out."

The silver colors that look the best are generally high in metallic particle content. But this makes them susceptible to softening or staining when exposed to glow fuel. So we shoot clear over them—and they go gray!

However, all is not lost. A material that's been available for years fills the bill quite nicely—Top Flite's* MonoKote. Yup, it's from the same folks who invented the propeller.

Straight off the roll, chrome MonoKote doesn't look like polished aluminum. But a little work with a ballpoint pen, a dressmaker's pattern tool, 600-grit sandpaper, No. 00 steel wool, or a Scotchbrite



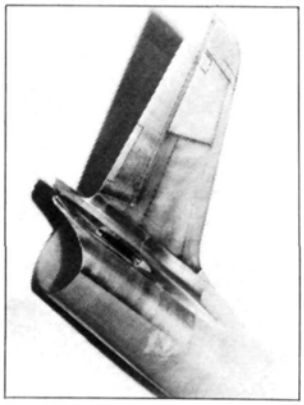
All the necessary equipment to do the job right. Note dressmaker's pattern wheel above ruler on left.

pad creates a very convincing, lightweight, and easily accomplished illusion.

Cover the parts with MonoKote in the usual manner. Draw the panel lines on with a ballpoint pen, pressing hard enough to make an impression in the balsa. Use the dressmaker's tool to create the "rivets," and burnish with 600-grit wet-or-dry sandpaper, steel wool, or Scotch-brite pad to simulate the different shades of aluminum skin.

iques

Above and below: F-86 tailfeathers given full burnished and rivetted treatment.



No fiberglass resin, sanding, priming, or spraying—nothing but the MonoKote equipment you already own and a 98-cent tool.

A side advantage of this technique is that it saves MonoKote! When covering large surfaces (like wings and fuselages), use overlapping small pieces to simulate the skin panels of the full-scale bird; it looks very authentic and allows you to work smaller areas separately, almost eliminating the possibility of wrinkles. Use a straightedge to make your cuts, and overlap the panels about 3/32 inch.

That's it, MonoKote gives you a scale finish in no time!

**The following is the address of the company mentioned in this article:*

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■

Tech Tips!

Recontouring Lite Flite Wheels

Creating a new look for these Dave Brown wheels.

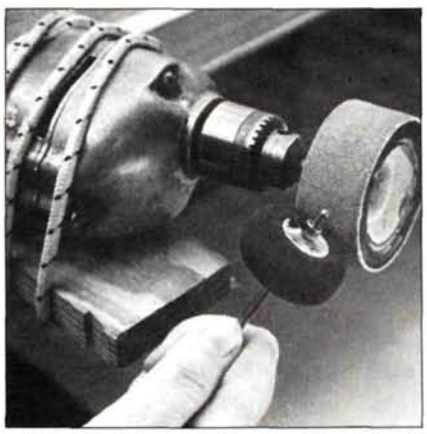
by JOE WAGNER

DAVE BROWN'S* new Lite Flite wheels are very light, highly shock-absorbent, reasonably-priced, and available in a wide range of sizes from 1½-inch to 6-inch diameter. With all these good features, it's unfortunate that the Lite Flite wheels have a major shortcoming: their tires look like they're for a dragster rather than an airplane.

But, it's not difficult to change these square-edged tires to a more rounded-contour balloon-tire profile. As shown in the accompanying photos, the reshaping is done with a 2-inch sanding drum mounted in a drill motor.

First, the wheels must be made for a free-running fit on the wire you want to use for your landing gear. As purchased, the wheels have metric-size axle holes. On the small-size wheels I've worked on, the holes are 3 mm in diameter: about 9 thousandths too small to fit on ⅛-inch wire. They're easy to drill out to a larger size. However, *do not* use a power drill for this. It will dig into the plastic wildly and ruin the hub; drilling by hand is the only way to go!

Next, get about a 6-inch length of axle-size wire and two wheel retainers. These are used to hold the wheel during the reshaping procedure. The wheel must be able to spin freely on this holding tool, since its rotation during the drum-sanding operation is what keeps the contour uniform all around.



The reshaping operation. Note the angle at which the wheel is held against the drum, important but not critical step.

Use a fine-grit sanding sleeve on the drum. The speed of a standard drill motor is about right; if you prefer to use a drill press instead, keep the speed moderate; too fast will gouge or burn the foam tire.

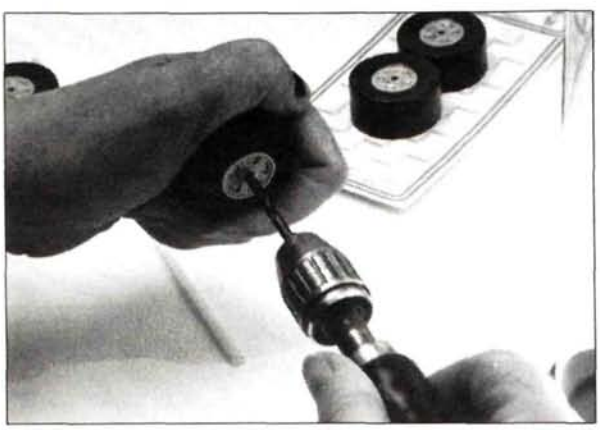
Hold an outer corner of the tire lightly against the spinning drum, with about a 75° angle between the drum shaft and wheel axis. This angle provides about the right proportion between abrasive action (reshaping the tire) and rotation (keeping the tire turning on the tool).

Sand the new contour *gradually* to the shape you want. No pressure is required; the sanding grit does all the work. You provide the guidance—and the patience. Actually, the procedure doesn't take a long time once you get the hang of it. When you find the proper angle and position of contact between tire and drum, the job goes along rather quickly.

One more suggestion: keep a vacuum cleaner handy to pick up the foam dust you'll be making!

**The following is the address of the manufacturer mentioned in this article:*

Dave Brown Products, 4560 Lay High Rd., Hamilton, OH 45013. ■



Opening up the axle hole is necessary for proper fit. A hand-held drill is the ONLY way to do this job safely.

A reshaped balloon tire at center surrounded by stock Lite Flite wheels and a few tools needed to do the work.

MINNESOTA'S

Sport Scale Sunday

Bob Porkorny's original design, KI44 Tojo. A 92-inch wingspan is powered by 3.7 Sachs-Dolmar. Original was fast but not maneuverable, model is the same.

photos by A. GORDON

by DAVID D. ANDERSON

Above: Ken Erickson's Pica T-28 has K&B .60. Fuse is covered with resin and glass cloth. Above right: Cockpit detail of Robin Crandall's Pica MK1B Spitfire was modeled after Imperial Air Museum photo of 1941.

THERE ARE only two seasons in Minnesota—the building season and the flying season. The building season is three times longer, encouraging scale airplanes to develop and suddenly emerge like mayflies when summer comes. So it was that Scale Sunday '87 originated in the mind of Bill Cowette, president of the Scale Flyers of Minnesota.

The Scale Flyers of Minnesota consist of scale-flying members who are also members of

Left: Winner of the Most Unusual award was Dick Baldwin's Aeronca C-3 Razorback, powered by Saito 90 four-stroke twin with switch and glow ignition. Above: Dennis Finch's Super-Tigre .75-powered Royal Me-109 is 8 years old. Rivets are drops of thickened paint.

Friendly competition could breath new life into your club.

other local R/C clubs. The Scale Flyers don't have a flying field of their own; instead the club depends on its members' clubs to co-host its scale events. This time, the Tri-Valley Flyers volunteered their grass field for a WW II munitions plant.

The day started with what Bill Cowette calls an entry-level contest. The rules are the same as AMA rules, except that the required flight maneuvers are simplified, and it's open to pilots who've never flown in an AMA-sanctioned scale contest before. Despite the novice-like ground rules, the quality of the entries would have scored well in any scale contest.

Wayne Siewert's smooth-flying Mooney M-20K is a frequent winner at scale contests.

The highest static score was earned by Rob Crandall's detailed MK-1A Spitfire, modeled after a veteran of the Battle of Britian. A realistically weathered finish was achieved by brushing K&B epoxy and Formula-U paint over ½-ounce glass cloth.

Duane Larson upped his static score by adding details to his Goldberg Cub. He added extra stringers to the fuselage, installed bungee-like springs on the landing gear, and redesigned the lift struts. The Saito 65 four-stroke provided plenty of power and realistic sound. Half-throttle was sufficient for Cub-like grace.

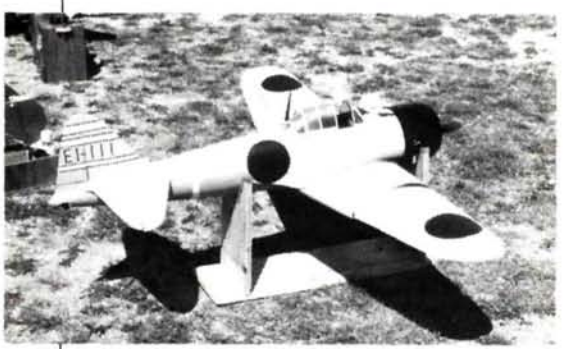
Jeff Mudek's P39 was underpowered at 7½ pounds with his old Super-Tigre 60. Nevertheless, he won the contest with the highest flight score. Jeff says the Top Flite P39 is a good choice if you want a warbird to just fly around. It's one of a few warbirds with trike landing gear. The contest ended at noon with congratulations to the victors. Then the flying really heated up.

The remainder of the day was spent in free-form scale flying with hidden judges lurking about the pits. Their task was to select winners for the best military, best civil, best bipe or tripe, most unusual, and best scratch-built awards. The winners received trophies and prizes donated by the local hobby shops, Gullivers, Hub Hobby, Jolly's, R/C City, and Hobby World.

The quality of the entries would have scored well at any scale contest.

Bob Porkorny's giant-scale KI-44 Tojo design won the best scratch-built award. It was expertly flown by John Clark, who claims to have never built a model airplane. This late WW II fighter has a 92-inch wingspan and is powered by a Sachs-Dolmar 3.7—that's nearly 7 horsepower. Bob reports that the very small stab caused the same problems that were reported on the full-size version. After the first test flight, Bob extended the leading edge of the stab.

John Clark's O.S. Gemini Twin-powered ¼-scale Sig Cub looks and sounds realistic. Slow flat-spins were spectacular.



Don Luce's O.S. 90 four-stroke-powered Top Flite Zero featured split flaps and belly tank.

Bill Hunch's Bud Light Laser 200 received the best civil award. This model, from a T&G Manufacturing kit, was designed for only a 4-horsepower engine. But Bill installed a Sachs-Dolmar 3.7, which develops nearly 7 horsepower. The extra stress caused by the large engine required some additional reinforcement—seven Du-Bro giant hinges in each aileron, beefed-up landing gear and control surfaces, and 4-40 wire

(Continued on page 70)

Hobby Shack

Field & Bench Review

EZ CAP 21

by CHARLIE KENNEY

Another super flying EZ, this time it's a CAP 21.

IT'S BEEN A long time since I did a Field & Bench for *Model Airplane News*, but this one was worth waiting for, the Hobby Shack* Sports Aviation EZ CAP 21 almost-ready-to-fly (ARF) airplane.

THE KIT. When you open the box you can plainly see why the term ARF is used. The wings, fuselage, and empennage parts are completely finished. I'd say 90% of the model is built and finished, with only assembly and outfitting left

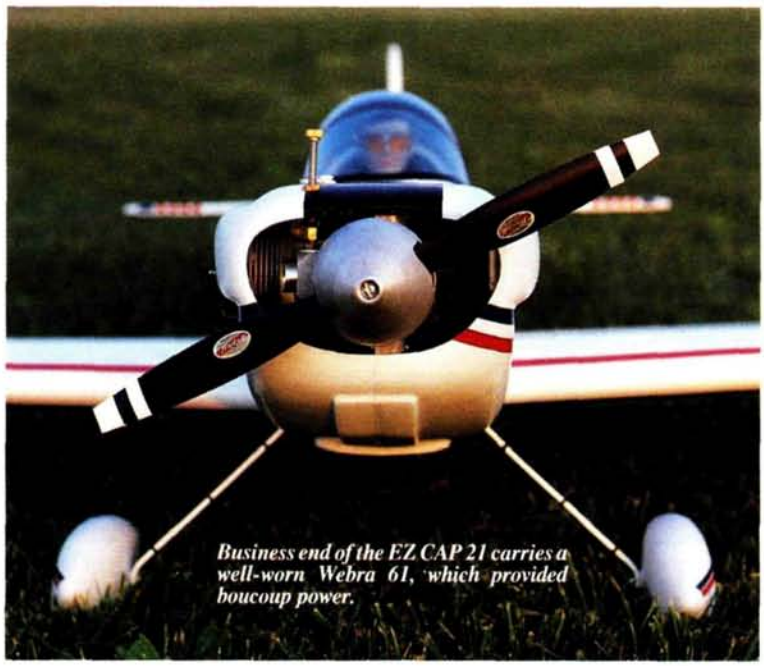
Type: *Sport scale*
Wingspan: *57¾ inches*
Wing Area: *553 square inches*
Engine: *.40 to .45 two-cycle or .60 to .90 four-cycle*
Weight: *5½ to 6¼ pounds*

photos by ACE PHOTOGRAPHERS

for the modeler. The CAP comes complete with gas tank, wheels, spinner, pushrods, nuts and bolts, and wooden servo-mounting trays; one for a forward position (if a two-cycle engine is used) and one for an aft position (if you opt for a four-cycle engine).

The secret of the CAP's great-looking appearance is the finishing technique used on the EZ models. These models are built on a plywood frame to which a composition-foam outer surface is applied with adhesive. A synthetic film with the model's color scheme is then placed over the foam and bonded in place. Finally, a clear fuel-proof protective film is placed over all the colored surfaces and the finishing procedure is complete.

This construction technique makes for a very lightweight yet durable structure. Also note that all hinged surfaces are complete, save for the rudder, since a steerable tailwheel must be mounted during construction. I spent about twenty hours on the assembly of the model, but keep in mind that I added a bit of detail.



Business end of the EZ CAP 21 carries a well-worn Webra 61, which provided boucoup power.

A few words about the full-scale airplane that the EZ replicates might be in order. The Mudry CAP 21 prototype (F-WZCH) is manufactured by Avions Mudry in Bernay, France. The model is about halfway between 1/5- and 1/6-scale (or 1/5.5, if you will). The model's wingspan is 58 inches.

I first saw the full-scale CAP 21 at the 1983 Paris Air Show and again in 1985, and was immediately taken by its appearance. The CAP 21 is a single-seat aerobatic competition aircraft which retains the fuselage and tail unit of the earlier CAP 20LS-200, but has cantilever main landing gear legs and an entirely new wing with a different planform and built by a new production method. This wing has improved the rate of roll by comparison to the CAP 20Ls and facilitates the execution of snap rolls.

The prototype (F-WZCH) was displayed at the 1979 Paris Air Show. It flew for the first time on June 23, 1980, and work was started on a first batch of ten production CAP 21s for customers in Belgium, Brazil, France, and Italy. Deliveries began in May 1982, and Mudry began manufacture of a second series in 1983. By early 1984, a total of 13 CAP 21s had been delivered, of which one had been retrofitted, easily and successfully, with a 260-hp engine. Wings are cantilever in this low-wing monoplane and are constructed of wood, as is the fuselage (except for the cowlings which are laminated plastic) and, of course, the engine mounts. The tail is also cantilever and all-wood construction. The standard powerplant is an Avco Lycoming 200-hp engine driving a two-blade Hartzel variable-pitch propeller. The transparent canopy slides to the rear.

Here are some salient dimensions: External: wingspan, 26 feet, 6 inches; wing aspect ratio, 6.95; length overall, 21 feet, 2½ inches; height overall, 5 feet, 0 inches; wing area gross, 99.0 square feet; weight empty, 1,103 pounds; max T-O weight (aerobatic, 1,367 pounds; max wing loading (aerobatic), 13.8 pounds per square foot. Performance: never-exceed speed, 236 mph; max cruising speed, (75% power) 165 mph; stalling speed, 53 mph.

Well, so much for the full-scale airplane, let's take a look at the model.

I mentioned that most of the construction work is done and the instruction book takes care of the rest. This 8-page book is well illustrated with over 44 drawings and photographs for reference. The one problem area I did encounter was with the stab and fin root cover. It needed a bit of trimming to fit and even at that there was a small gap at the front of the fin, which seems to be common on many of the EZ kits. This was virtually the only flaw I encountered and was a minor one to say the least.

If you're interested in spending a little more time on the CAP 21, you can make a very nice standoff-scale model. It requires just a bit more effort and some paint. The wing, for example, needs to have the wing tips painted blue and both the upper and lower wing striping pattern continued on the ailerons. The horizontal stab and elevator tips should also be painted blue. I used Cheveron red and blue spray cans. Also, the tips of the ailerons on the full-size CAP are aerodynamically counterbalanced and that can be added if desired. However you can't find this feature in the EZ directions. You must go to someone like Repla-Tech* for reference, as I did. *(Continued on page 62)*

America's team to the World Championships includes, left to right, Steve Helms, Chip Hyde, Manager Dave Brown, and Tony Frakowiak.

by MIKE LEE

MASTERS

TOURNAMENT

The cream of the crop did battle to represent the U.S. in the World Championships.

Top: Bill Cunningham waits with Escape. Middle: Jim Bennett awaits noise check. Bottom: Tony Frakowiak prepares Challenge.

IT'S BEEN CALLED the meet of the best for the best; but it looks more like the shoot-out at the OK Corral. Whatever the comparison may be, there's no denying the fact that the U.S. Masters Tournament will determine the best three pattern pilots in the country.

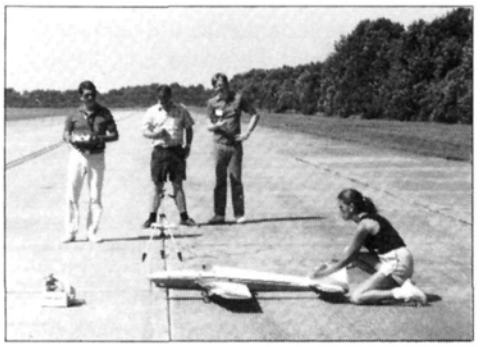
The Masters Tourney is held every other year in the states for the purpose of selecting the U.S. Team to the World Championships. Different sites are selected for each tournament, allowing an opportunity for pilots from all over to participate. This year's event was hosted by the Tidewater R/C club of Chesapeake, Virginia. The site was Fentress Naval Auxiliary airfield, just outside of Chesapeake. Fentress provided more than 8,000 feet of concrete runway for the pilots, the Navy not only shut down the field for the competition, but also provided entertainment later on.

The dates for the meet were June 18 through 21; just four days to select a team. Of over 60 pilots, only three would make the cut. Here's the way they did it:

Selection of the top pilots was based upon strict FAI rules for Turnaround, right down to the noise measurements. Six rounds were flown to determine the top ten pilots. Scoring was normalized according to the best scores from each flight line per pilot. Three flight lines were formed, each manned with five judges. Pilots had to show up at the flight line ready to fly on time. At the start of the timer's clock, the pilot had one minute to start up, and a total of three minutes to get airborne. Time wasn't counted when the noise test was performed. Total time for the entire flight (including all ground time) was ten minutes. Sounds easy, but try it yourself sometime, it's not a piece of cake.

Dean Pappas with his ever-present smile displays Maya; finished in ninth place.

After preliminary rounds, the top ten pilots progressed to the fly-offs. This was a brand new contest, flying four rounds in front of seven judges, two flight lines, with pilots changing lines each flight. The



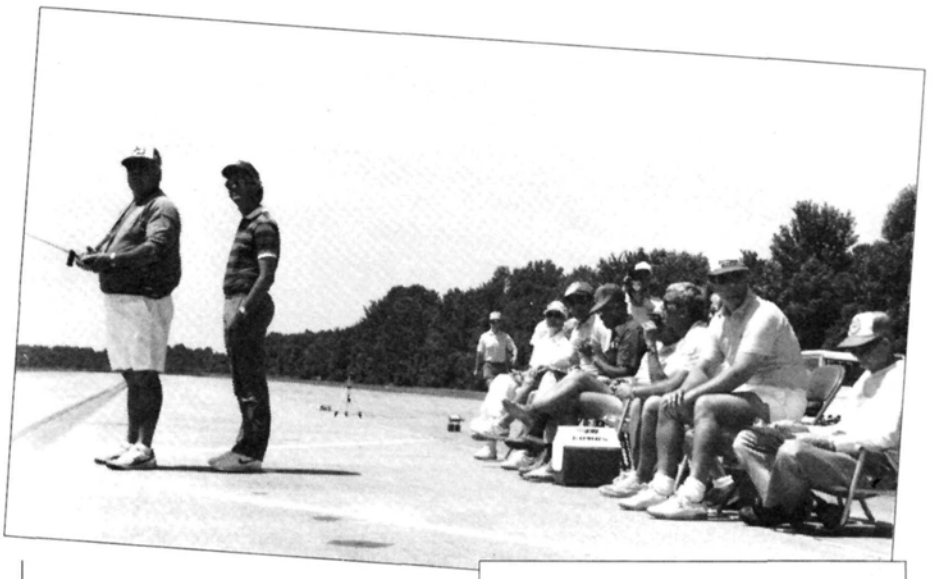
Juan Romero awaits sound reading while wife Carolyn holds his Phoenix 9.

same rules and same scoring were used with the high and low scores thrown out. From these ten pilots, five had to be eliminated, two more rounds would then select the "top guns."

During opening rounds, the weather was windy and cross to the runway. The direction of takeoff was left to right, and the battle began. Many of the pilots flew large FAI ships which were fairly slow compared to their AMA counterparts, but still powerful. The wind took its toll on the big ships, preventing them from really demonstrating their full potential. Many pilots came dreadfully close, if not over, the time limit (from fighting the wind and using precious seconds). Amazingly, only two pilots failed to post complete flights in the opening rounds due to engine problems, reflecting their complete preparation. Forty-two pilots were going at it with an unmatched level of professionalism.

The second day began with the wind blowing in the completely opposite direction. It was very muggy and the humidity was over 90%. This proved to be a big factor in equipment, as many pilots (including this one) were busy changing their rusted engines.

The contest management was really excellent. Mr. Mike Ingalls and the Tide-



How would you feel with this many people watching your flights! Minimum of five judges were used for the prelims.

Above: Mike McConville had this nice LA-1, finished twelfth. Left: Steve Rojecki lands his Brushfire in sixth.

Left: Chip Hyde prepares to start while dad Merle holds. Above: Steve Rojecki lights his Brushfire. Right: Don Weitz hooks up his Tx harness as Jim Kimbrough holds.

Left: Steve Helms watches the competition as he waits his turn with YS-powered Aurora. Below: Bill Rutledge prepares Summit II.

water R/C club went ultra-professional when they hosted this one. All scoring was performed by computer tabulation. The judges were given score sheets which required them merely to darken a spot next to the score they desired. The score sheet then went to the computer card reader who passed it instantly through the main processor. At the end of the round the operator (Mr. Mike Lomin) simply requested a tally, and the computer produced it. Instant scores with little pain. Fantastic!

Along with this was the excellent help from the Tidewater club members. The pilots were accommodated at every turn, making the job of flying just that—simply flying. The sense of friendship from the locals was unsurpassed as well.

The flying commenced at 11:00 a.m. each morning, allowing time for pilots to get in some practice. The two rounds of the day were easily finished by the 5:00 p.m. deadline. Then the Navy took the field and showed us all how to perform carrier deck landings: Goodyear can't guarantee those tires!

Day three opened with a do-or-die attitude of the pilots. The throwaway flights were over, and top scores were the order of the day. The wind was blowing down the runway from right to left. Chris Lakin experienced the only casualty of the entire meet. His bird developed a flutter to the elevator, ripping the ship apart during the outside loops. In seconds, it became a smoking hole in the ground, and Lakin lost his chance at the finals.

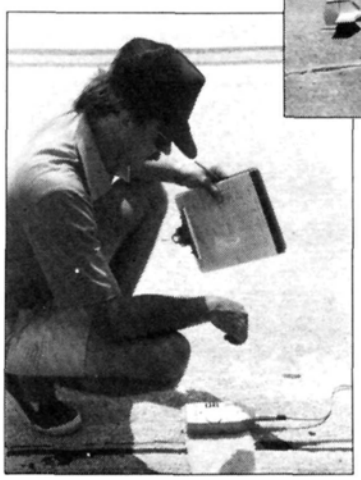
As for the flying, the "box" was defined according to the FAI: prescribed white poles, at a 60° angle from center and 450 feet out. A center marker was also placed at the 450-foot mark for center reference. Truthfully speaking, I only saw one pilot adhering to the 450-foot distance. That didn't last long, since the better way to fly was definitely further out. Most pilots were about 600 feet out, executing very large maneuvers. The cross winds played havoc with us, forcing obvious heading corrections in order to keep from visiting the next county.

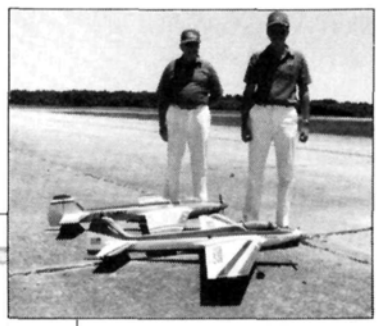
The night was Saturday, and the top ten pilots were to be announced at the banquet. It was another top-notch event, in keeping with the rest of the contest. Guests of honor included the Mayor of Chesapeake, Sidney Oman, the Commanding Officer of Fentress NAS and Oceana NAS, Captain John Allen, the AMA president and Masters pilot, Don Lowe, and AMA Executive Director, John Worth. These people were joined by the Tidewater R/C officers and the Contest Director, Mike Ingalls. After a few awards were presented the top ten pilots were announced. They were: 1. Dean Koger; 2. Tony Frakowiak; 3. Bill Cunningham; 4. Steve Helms; 5. Chip Hyde; 6. Steve Rojecki; 7. Don Weitz; 8. Bill Rutledge; 9. Jim Bennett; 10. Dean Pappas.

This was the order of standings after the first six rounds. Koger was flying the best I've ever seen. His ship (one of his own designs called Vortex) was flying very powerfully in the wind. Frakowiak was flying the Mark IV version of his popular Challenge design. Cunningham flew the Escape, a familiar AMA bird. Helms flew perhaps the most powerful ship of the meet, an Aurora. Hyde followed up with another Aurora (actually 3 of them) but it wasn't nearly as fast. Rojecki flew his AMA-designed ship, the Brushfire. Weitz flew the only four-stroke (and scale at that) powered ship to make the top ten, a Zlin 526. Rutledge flew a Summit II, which was nicely done from a kit. Bennett made it on the wave of yet another Aurora. Pappas made the cut flying his now familiar Maya design.

Virtually all the ships at the Masters had their tuned pipe enclosed, sunken, covered, or blended into the airframe in one way or another. This was done to clean up the ships and assist in getting the noise down. Not one ship failed in the sound testing, but in accordance with FAI rules, several ships were downgraded in flight for excessively noisy engines: this cost 15 points. Some other pilots were rewarded that same 15 points by being very quiet in the air; Koger made it every flight.

An official uses dB meter to check sound, all equipment was calibrated hourly.





Malcolm and Bill Rutledge stand by two immaculate Summit II ships from Zimbabwe Models.

Ninety-five percent of the planes had wing areas exceeding 810 square inches, yet only a couple weighed more than 9 pounds. Engines varied, but the most

(Continued on page 85)

Stiff competition built to an exciting tie-breaking fly-off!

R/C HELICOPTER CHAMPIONSHIPS

by CRAIG HATH

I WAS FORTUNATE enough to attend the AMA Nationals in Lincoln, Nebraska, recently, held from July 11 through 19. Many aspects of modeling are covered at the Nationals, including free flight, control line, and radio control. There were so many events going on that several sites around the Lincoln area were needed. Radio-Controlled Model Helicopter was held at a park not far from the downtown area. The site was ideal, as there was a very large unobstructed grass field and plenty of room for spectators.

There are four different categories in the R/C helicopter event—scale, novice, intermediate, and FAI—and they've all been tailored to allow for a flier's particular skill level and capabilities. The scale class addresses modelers interested in duplicating full-size helicopters on a smaller scale, and then permits them to be judged alongside other models for static authenticity and flying realism. The remaining three events are for flying skill only and are structured around a set of maneuvers which each pilot must perform in sequence before a group of judges. The FAI class differs slightly from this in that the pilot selects a routine from a list of available maneuvers, in which four of the maneuvers are compulsory and four are optional.

photos by BLAINE HATH

The "gang" from Rotary Wing Concepts in force. Their presence was felt, as they had participants in every category.

Above: Bill Crain's Hughes 500D won second place in scale. Machine uses unique Peka five-blade rotary system. Right: Aerospatiale 355 Twinstar by Wendell Adkins uses Schluter Champion mechanics; finished fourth.

Participating in an event of this nature can be very challenging, along with the added benefit of sharpening your flying skills. This type of competition also seems to breed improvements in the machines themselves, making an impression on all facets of the sport.

Flying started on Monday and continued through Wednesday. The weather was less than cooperative, as there seemed to be something different every day. There were strong winds blowing for most of the contest, adding an extra challenge to the pilots' task. Tuesday morning brought rain, which caused some delays. Otherwise, the events were run without interruption, and all of the flying was wrapped up early on Wednesday. The final round of the FAI class ended in a tie for first between newly crowned world champion Curtis Youngblood and Robert Gorham. The tie necessitated a fly-off which was very close again, with Youngblood just edging out Gorham.

Overall, the group which ran the event this year came very prepared and did a great job of keeping things moving. There was a small turnout of only 38

Lucky thirteenth was Alan Dye's finishing position, with GMP Stork SE, in very tough FAI class.

entries, which seemed strange for a sport which is growing so rapidly. Perhaps if there were more local contests the turnouts would be much larger. Another area which could be responsible for getting more participation would be a special interest group. Groups now exist for all types of flying, like R/C patterns' NSRCA, the R/C pylons' group NMPRA,

OFFICIAL RESULTS

Novice Helicopter

1. Peter Chow, San Carlos, CA
2. William Johnson, Duluth, GA
3. Silas Kwok, Fremont, CA
4. Bill Crain, Mt. Pleasant, TX
5. Lou Bohres, St. Louis, MO

Intermediate Helicopter

1. Gilbert Ruiz, Phoenix, AZ
2. Gregory Sawyer, Kansas City, MO
3. Vincent Petracek, Webster Groves, MO

FAI Helicopter

1. Curtis Youngblood, Bryan, TX
2. Robert Gorham, Neubury Park, CA
3. Mike Mas, Plantation, FL
4. Dan Chapman, Dayton, OH
5. Dave Youngblood, Bryan, TX

Scale Helicopter

1. Silas Kwok, Fremont, CA
2. Bill Crain, Mt. Pleasant, TX
3. Don Chapman, Dayton, OH

Four of the five from the Intermediate class, from left to right, Greg Sawyer 2nd, Gilbert Ruiz 1st, Gary Cline 4th, and Mark Wilson 5th. Scores were very close.

and scale's Scale Squadron, and Eighth Scale Air Force, etc. These groups organize events and work with the AMA to represent their special interests. To date, no such organization exists for model helicopters. Maybe it's time for one. Let me know how you feel about this point. At any rate, if you ever have the opportunity to attend the Nationals, be sure to take advantage of it! There is much to see, and all of it is interesting. ■

Helicopter Challe

by CRAIG HATH

GETTING A MODEL helicopter into a condition of trim that's acceptable for normal flight is a skill that must be learned. A beginning flier in the process of trimming is in for a difficult situation. I've been giving the basic trimming process a lot of thought lately, and am trying to approach the system in a way that will be easy to understand and perform. The term "trim" refers to the adjustment of all the controls of the helicopter in combination with the throttle and main rotor pitch. This produces flight characteristics which include a stable, hands-off hover at the correct main rotor speed with the engine operating in the proper power band. Additional to this set of conditions is the setup of controls to allow for full-throttle forward flight, controllable descents, aerobatics, and autorotation landings. The effort required to achieve perfection here is substantial, but don't let that lead you to the conclusion that trimming is an impossible task.

The amount of available information on the setup and flight trimming for model helicopters is steadily increasing. There was a large void of information on this subject only a few years ago. Consequently, most beginning fliers learned by experimentation and trial and error. This system was very costly, and left learning only to those who were extremely dedicated, taking the fun out of it for the sport enthusiast. Getting the R/C helicopter into a shape that allows for nearly hands-off hovering and simple flight training maneuvers should still be approached by someone with experience, if possible. I've spoken with many people who are on their own, and have attempted to verbally explain every aspect of flying over the phone or by mail. But it has occurred to me that I probably haven't always gotten my point across. If there's going to be an exchange between beginner and expert, there must be a dialogue which can be understood.

Bob Pickens' Gorham Model Products Cobra Jet Ranger is a fine looking and flying helicopter. Bob has done a beautiful finish on his example.

This is a prime example of why helicopters excite so many modelers with their sleek lines and many details. This one is R-Wing Concepts' B-222.

Modelers with enough time and understanding of their machines often use terms that are new to the beginner and take for granted some details that seem obvious to the expert, yet must be explained to the novice. With that said, let me restate that this column is intended to help the beginner and average helicopter enthusiast.

In the next several columns, I'll go into more detail on some of the basic necessities of flight trimming. My objective is to give basic guidelines which can be followed by anyone, and should produce a helicopter that's easy to fly and predictable enough to learn with.

In the beginning, all helicopters were created equal...these days, it's not so simple. Whenever there are major design differences between popular helicopter kits which require changes in their setup I'll try to point it out.

The first area to be covered is usually the most difficult area to master for most fliers: the tail rotor system. The job of the tail rotor system is to counter the energy sent from the engine through the main rotor blades. When the engine spins the

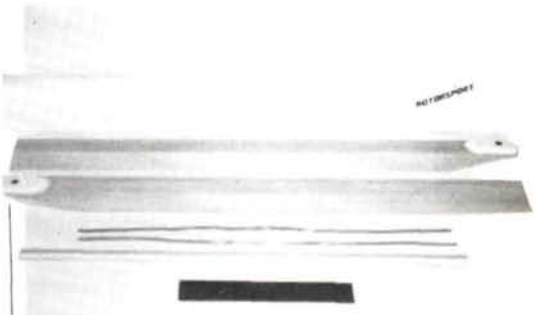
main rotor blades, an opposite reaction to the force required to turn the blades occurs in the fuselage. This force is called torque. Torque varies with changes in engine power. Torque causes the helicopter to twist against the rotation of the main rotor blades. It's important to know that as torque increases, the body of the helicopter will turn in the opposite direction of the main rotor rotation with greater force. The tail rotor system spins a set of blades which creates lift just like the main rotor blades, the exception being the lift applied to the yaw axis of the helicopter.

The term yaw axis refers to an imaginary line which runs through the helicopter, from the very tip of the nose all the way back to the end of the tail. This line is perpendicular to the main shaft and is split at the point where it intersects the main shaft. The motion that's normally associated with the yaw axis is rotation of the helicopter around the main shaft. The rotation may be in either direction, and is comparable to the motion one might experience if he were sitting at the end of a petal on a pinwheel. The lift produced by the tail rotor system is used to counter the torque reaction caused by the application of power to the main rotor and to steer the nose of the helicopter. Steering is accomplished by increasing or decreasing the lift of the tail rotor. Changes in lift are caused by changing the pitch of the tail rotor blades. Notice I have mentioned increasing and decreasing lift of the tail rotor. The torque reaction of the helicopter will naturally make the nose of the helicopter turn in one direction if the lift of the tail rotor drops below that which is required to hold the nose still. Generally, if the lift of the tail rotor is decreased completely, the helicopter will rotate very rapidly in one direction.

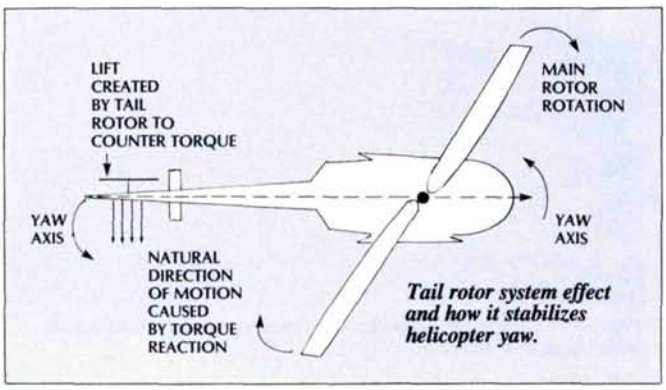
The Boom Saver drastically reduces boom damage. Product by North-Bilt Products.

Hopefully, you can now understand the job of the tail rotor system. Next, let's take a look at the proper setup of the tail rotor.

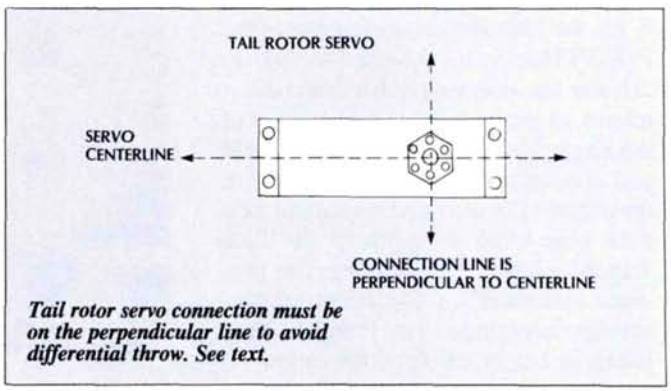
Let's start by taking a look at servo installation. Be sure you have mounted the servo properly (all four screws are in place) and have put vibration-absorbing grommets under each screw. Check the lead-out wire to be sure that it doesn't contact any surface which might rub through the insulation and short out the servo. Move the rudder trim on the transmitter to the center or neutral position. Take a look at the servo output arm. Is the point which connects the tail rotor pitch control linkage to the arm exactly straight up or down? Is the point shifted to one side or the other? If the point is shifted to one side, you'll be experiencing a property that's a by-product of the conversion of motion from rotory to linear. This means that if the point being moved is not exactly in the center of the servo travel, there will be a differential in total movement from one side to the next. In the case of the tail rotor linkage, you would have more left than right, or vice versa. *(Continued on page 119)*



Rotorsport blades by Miniature Aircraft USA. Note new blade mounts of molded urethane.



Tail rotor system effect and how it stabilizes helicopter yaw.



Tail rotor servo connection must be on the perpendicular line to avoid differential throw. See text.

Jet Blast

by RICH URAVITCH

I'VE BEEN DIGGING out some industry info and have come up with what could be a major breakthrough for us fan fans. How's this sound: a Sport Scale airplane with a fiberglass fuse and pre-sheeted foam cores; a time-proven high-performance fan unit and engine; and in a package that only requires about 10 to 15 hours to assemble, complete with a modest price tag?

A *very* reliable source has provided this information, which I have reconfirmed through a second source. It's already out of the planning stage and into execution. Prototype airplanes will be available shortly after you read this column. No doubt this will provide the vehicle for a lot more folks to try fanning...I'll tell you more as the project progresses....

The Blue Hornet

Okay, guys, there's another wood/foam kit coming your way, for those of you who dislike working with fiberglass. It's from Bob Parkinson Models* and follows on the heels of their Regal Eagle. It seems that more of these F-15ish-looking models are appearing and are being successfully flown by newcomers to the fan world. The formula: keep it simple, buildable, and affordable. It seems to work, and has been carried over to the new airplane, the Blue Hornet.

As the Regal Eagle approximates the F-15, the Blue Hornet approximates the F/A-18 Hornet. It's designed for .61- to .81-size fan units, and Bob tells me that it retains all the pleasant flying qualities of the Eagle, but is even a bit faster in flight and acceleration. It really looks good in the pictures I've seen, and is a natural for a dark blue finish to duplicate the Blue Angels' scheme. The markings are provided and there's a significant weight-savings advantage, too. Imagine these babies in a tight, diamond formation!

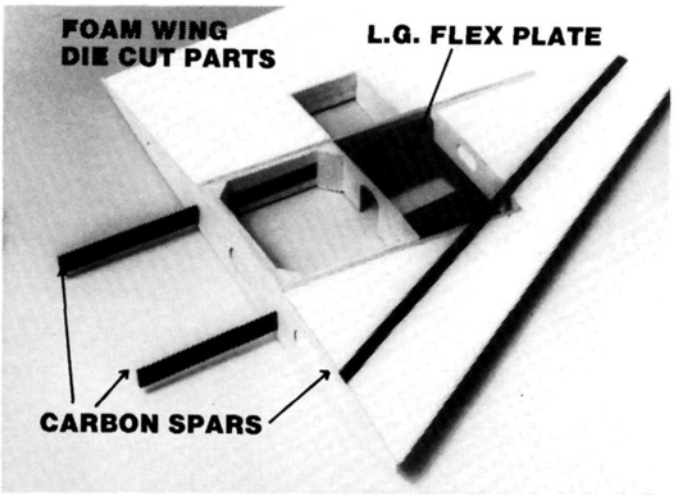
Speedy Aggressor

For those of you who haven't heard, a Bob Violett Models* Aggressor, flown by their west coast demo pilot, Ron Gilman, was clocked at a two-way average of 169.72 mph! The speed mark was established using USAF precision tracking radar. Having spent a good deal of time at Edwards AFB, I can tell you that it's miles and miles of flat desert, an ideal location for speed records. Apparently, the Air Force also thinks so, since it's the home of its Flight Test Center.

Upon hearing the news of the speed record, I came up with some conclusions of my own. Ducted-fans have come of age and their design development has matured to the point where their performance is second to none. I'm quite sure this sort of speed isn't for everyone, but a benchmark of performance has been established for others to chase. Congratulations, Ron!

Some of you have asked if there are any differences in construction between the Violett Sport Shark/Aggressor and the new Viper. Well, the wing construction is significantly different, as the Viper uses foam cores with extensive integration of Magnalite (carbon fiber) for spars and retract plates. The Sport Shark series uses built-up structure (pre-built) with conventional ribs and composite materials (including Magnalite) for high-strength areas.

Soon to be offered by Bob Parkinson Models, the Blue Hornet. Features similar construction simplicity as Regal Eagle but is claimed to be faster.



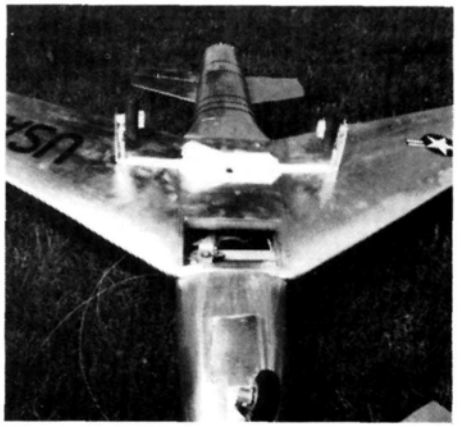
Inner workings of the new Bob Violett Models Viper. Uses foam core rather than built-up construction, as in the Sport Shark.

U-Control Fans

Just to show you that fan-powered airplanes don't necessarily have to be R/C, Charlie Bauer of Top Flite Models provided some photos of his RK-740-powered Paul's Flying Stuff (formerly House of Balsa, formerly Bob Martin Models) F-86 Sabre. The fitting peering through the cheater hole isn't a fan blade, and the wires aren't antennae... Charlie's Sabre is U-Controlled! You know, the kind that never fly away...well, almost never!

Charlie says that it flies fine and was covered with (what else?) Super Mono-Kote! I could have saved some time (and probably learned something) by letting Charlie write the "Sporty Scale Techniques" article in this issue.

Bauer's F-86 with access hatch removed. Note control lines entering left side of fuselage.



Bottom shot of Charlie Bauer's control-line version of Paul's Flying Stuff (nee HOB) F-86. Ducted-fan control-line, imagine the possibilities!

As you're reading this, we're in the final preparation mode for the annual Southwest Fan-Fly; a full report will follow.

For peak performance, stay tuned....

Rich Uravitch, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this column:*

Bob Parkinson Flying Models, 3 William St., Ontario, Canada LOL 2NO.

Bob Violett Models, 1373 N. Citrus Rd., Winter Springs, FL 32708. ■

duke's mixture

A good reliable idle is a great confidence builder. Most motors will idle reliably if the plug is good, fuel is fresh, and the mixture is set lean enough. If the mixture is too lean, the engine will idle well, but when you give it the throttle, it will run dry, cough, and die. If it is too rich, the engine can continue idling for quite a long period, but fuel gradually accumulates in the case, and when you give the motor the throttle, the liquid fuel splashes up into the cylinder and drowns the plug. The way I go about adjusting the idle mixture is to pinch off the fuel line and see how the engine acts when the fuel is shut off. If, after stopping the fuel, the motor runs more than 10 or 12 seconds, then you have the mixture too rich. If it shuts off in less than 4 or 5 seconds, your mixture is too lean. This check should be made after the engine has been idling for 15 or 20 seconds, so the crankcase accumulation can stabilize. Once you have an adjustment that seems to work, it's best not to fool with it.

Now, things that can foul up the detail: (1) A plug that has become oxidized. (2) A fuel that doesn't have enough nitro. Now, assuming that you have a good plug, a fuel that's right for your engine and conditions, and your adjustment is right, if the engine still doesn't idle reliably, the things to look for are air leaks. Air leaks could come from a rear cover that is loose, a leaky gasket, a worn main bearing, a piston skirt that has become worn, leaks around the carburetor barrel, or leaks around the high speed needle threads. These will all contribute to an unstable idle.

Tightening the rear cover or replacing the gasket will usually take care of that kind of problem. A little bit of hose between the high speed needle and the seat can stop an air leak around a needle valve. If you have a worn piston skirt or worn main bearing, there is nothing but a major engine repair that will do much good.

If your engine seems to idle satisfactorily with the glow plug heater on, but slows and dies when the glow plug heater is off, try one of our Miracle Plugs. If that fails, try changing fuel. An inverted motor is always more difficult to get to idle reliably. Avoid inverted installations whenever you have a choice.

Don't be like my friend who thinks zero R.P.M. is the proper idle speed, yet grumbles when he hits the throttle for a go around and nothing happens. Not one in a hundred models can't be landed with a 3000 R.P.M. idle speed, and most motors properly adjusted are better than 99% reliable at this R.P.M.

As a motor wears and you start to get more leakage, the first symptoms to appear are idle problems when the engine is hot. That is, your motor will seem to idle quite nicely when you first start it up and taxi it around on the ground, but when you take it up and run it hard for a while and get it good and hot, and then pull back for an idle, the oil that seals around the piston skirt and the bearing is thin and doesn't hold compression like when it was cooler. The result — it quits. Sometimes it is pretty hard to convince a customer whose motor runs like gangbusters that it quits at idle because it has seen too much flying time — but such is often the case.

Now — the opposite situation — A brand new motor will very seldom idle reliably until it has run enough to free up. A motor that is nice and free can misfire a time or two and still carry on, whereas a tight motor will stop if the motor misfires once.

If anybody out there would like for me to talk about any particular subject — tell me what it is.

Thanks you all,

Duke Fox

Small Steps

by JOE WAGNER

ONE SUNDAY I went to an airshow which featured both full-scale and model aircraft. Most of the models on display were the usual .40-and-up types. But among them I saw an unusual small R/C airplane: an enlarged version of a 1940-era rubber-powered model.

With a wingspan of about 4 feet, this looked to me like an ideal schoolyard flyer. I asked its builder what he had in it for power since it was too far away for me to tell.

The Gentle Lady is big for its Cox QRC engine, but easily flies within a schoolyard.

"An O.S. .25," he said.

I fly bigger models than .049s, so I could hardly believe it. He brought the airplane over for me to hold—and then I believed it. It weighed almost 4 pounds!

Thinking about this later, I began to remember my early days in R/C some forty years ago. At that time I figured an R/C flight was successful if my model crashed at a different spot than it did as a free flight. Early R/C equipment was bulky, heavy, and unreliable. The batteries alone weighed almost a pound and the receiver had to be retuned before each flight. No wonder most of my flight attempts ended in impact-type landings!

As a result, I began beefing up my R/C models. I wanted them strong enough to withstand plenty of punishment—and they got punished all right.

I went on in this less-than-satisfactory way for over five years. Then it was my good fortune to work on an R/C model project with Dick Schumacher, one of R/C's great pioneers. "Schuey" taught me the secret of successful R/C: keep your models *light!*

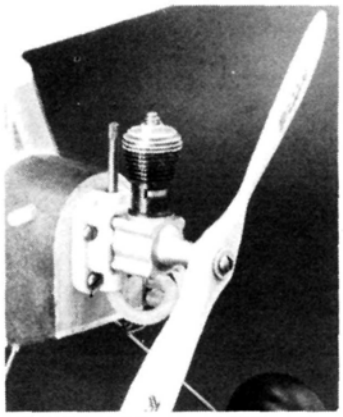
Reinforcing one part, strengthening another; putting in plywood bulkheads and doublers for "crash insurance"—these make for heavy airplanes. Heavy models fly fast, stall easily—and hit hard. That's exactly what mine did, too!

Dick Schumacher's models didn't fly that way. His Liberty Belle (a ½A R/C model Schuey designed in 1952) was a real eye-opener for me. An all-sheet-balsa design except for its built-up wing of 300 square inches, it had rudder-only control; ready-to-fly it weighed a mere 17½ ounces!

One secret was careful wood selection. Liberty Belle's fuselage and tail were built from balsa so light it could've been used for indoor models. Schuey also thoroughly sanded all parts of the model to reduce weight even further. Finally, the model was covered with Jap tissue and doped just enough to seal the surface.

With a wing loading of less than 8½ ounces per square foot, Liberty Belle might seem to many of today's R/C modelers as too much of a floater to fly in windy weather. Not so: at the '52 Nationals when the wind kept *all* the other R/C models grounded, Schuey merrily flew the L.B. again and again.

Watching Liberty Belle's performance changed my philosophy about R/C modeling. Schuey showed me that beefing up a model for crash protection was unnecessary. Built light, a model is unlikely to crash—and if it does, it won't hit hard.



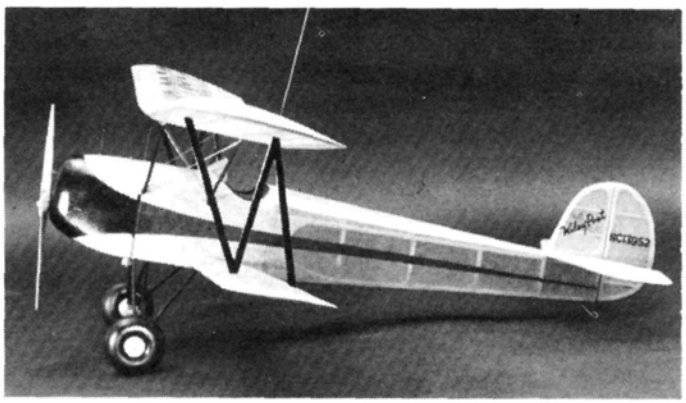
RTF Cox 049 is a good R/C engine, easily connected to an internal tank.

Lightweight building does require more care and forethought than assembling die-cut plywood or contact-cementing plywood covering onto foam plastic wing cores; but the rewards are great.

One of the local R/C fliers doesn't believe this. He says you need to have a fairly heavy model for wind penetration. Otherwise your model gets blown downwind and you can't bring it back.

Obviously, this guy didn't see Dick Schumacher flying Liberty Belle at the '52 Nationals. But lots of other folks share the belief that there really is such a thing as penetration. And that a heavy airplane has it, while a lighter one doesn't.

But you and I both know that an airplane's flying speed depends only on its thrust and drag. Thrust comes from



An 020-powered Wiley Post bipe is great fun on its two-channel Cannon micro system.

engine power, which is only slightly related to airframe weight. (Larger engines weigh a bit more than small ones and require a sturdier structure to hold them.)

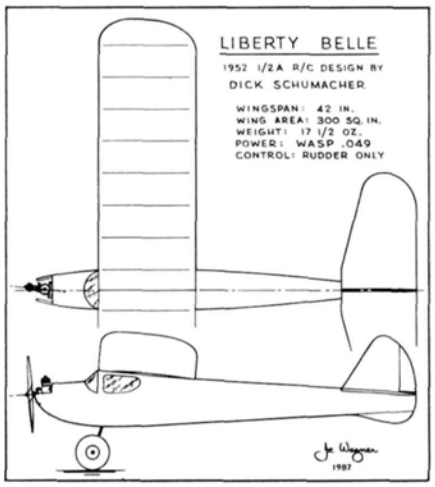
However, drag is affected a great deal by the airplane's weight—far more so than by a smooth finish or retractable landing gear. Why? Because to lift a heavy model the wing has to work at a high angle of attack. And as the angle of attack goes up, so does the wing's drag—way up, in fact.

Let's reconsider the R/C airplane I saw at the airshow, the .25-powered enlarged rubber model design. It had to have a big motor to overcome all the drag its wing produces at the high attack angle necessary to keep almost 4 pounds aloft. Does it have a higher top speed than one of my similar-sized .049 ships? Well, not having seen it in flight I couldn't say for sure. But I guess it wasn't much faster, based on aerodynamic considerations.

A model such as my ½A Crow, with 325 square inches of wing and a weight of 24 ounces, only needs an attack angle of about 2° for level flight at say 20 mph. This is optimum for the Clark Y airfoil, with a lift/drag ratio of 14 to 1 at a 2° angle.

If I want to fly faster, I just push the nose down a little. That brings the wing to about ½° angle of attack. The airspeed is around 35 mph—enough to battle any wind.

The enlarged rubber model (being so heavy) needs a high angle of attack to sustain level flight. This produces a lot of drag. Thus, a lot of power is required just to pull the airplane through the air and keep it from sinking. Even worse, a high angle of attack puts the airfoil close to its stalling point, where a sharp turn or an abrupt pull-up close to the ground can spell doom.... There's no question about it: a lightweight model is the *only* way to go for small-field R/C airplanes.



Liberty Bell, a 1952 ½A design by Dick Shumacher, is a straightforward good-flying design.

We goofed! In the September 1987 issue, we credited the "Small Steps" column to Randy Randolph. Joe Wagner actually wrote the article and we regret the error. We apologize to Joe, good-natured though he many be, and to the loyal followers of this popular column.

Author's first ½A R/C design, Buzzard, was built in '53 and was powered by a Thermal Hopper 049.

A few paragraphs back, I mentioned that a smooth finish isn't as important in reducing drag as less weight is. I'll go even further than that: A smooth finish might even produce *more* drag than a slightly roughened one. Why? Because a matte finish on an airfoil appears to significantly increase its lifting power. This allows it to work at a lower angle of attack and bring its induced drag down.

Here's why this works. In flight, the surface of a non-glossy wing imparts a spin to the air that passes over it almost the same way a tennis racket puts spin on the ball. Topspin on a tennis ball makes it drop as it flies over the net. The topspin a mildly rough wing puts on the air makes it drop as the trailing edge leaves it behind. This extra downpush can add appreciable lift.

Here's an example: A friend of mine built a Gentle Lady awhile back, powered by a Cox Tee Dee .049, covered with one of the slick-finish iron-on films. It weighed 33 ounces, but wouldn't climb at all....

Last spring I helped an 11-year-old build his first R/C model: A Gentle Lady powered by a Cox QRC .049. It, too, weighed 33 ounces and it flies just fine, gaining altitude nicely with a little ½A powerplant. What made the difference? I think it was the slightly roughened finish of the Goldberg* Colortex we covered it with.

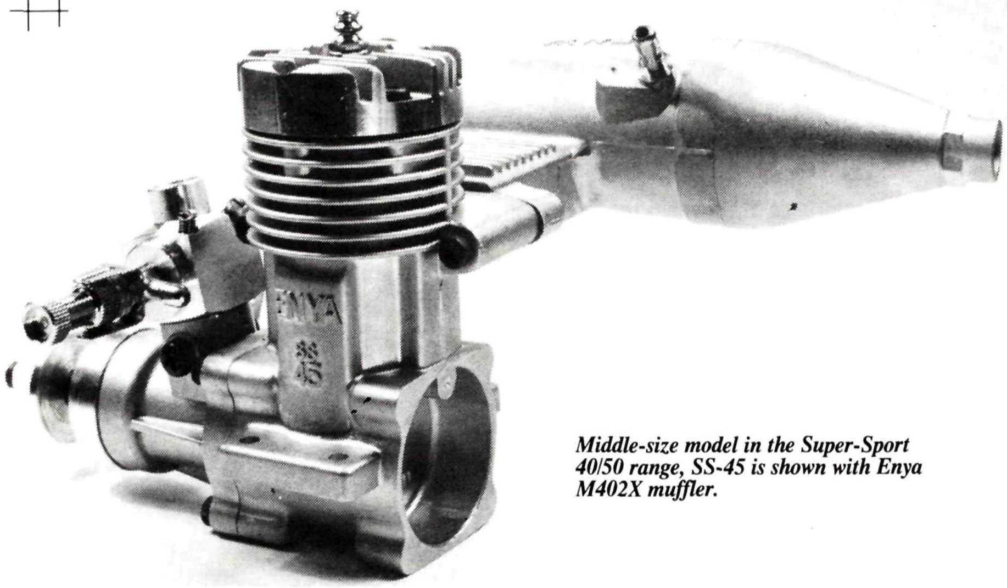
Maybe that's why my own models all fly pretty well. I never strive for a glass-like finish. In fact, I kind of like the looks of balsa grain, and most of my all-sheet-balsa models are finished with just three (or so) coats of clear dope and cut-from-colored-tissue decorations. This saves time, weight, and money—and makes for excellent flying characteristics.

Joe Wagner, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this column:*

Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 60651. ■

Engine Review



Middle-size model in the Super-Sport 40/50 range, SS-45 is shown with Enya M402X muffler.

Enya Super-Sport 45

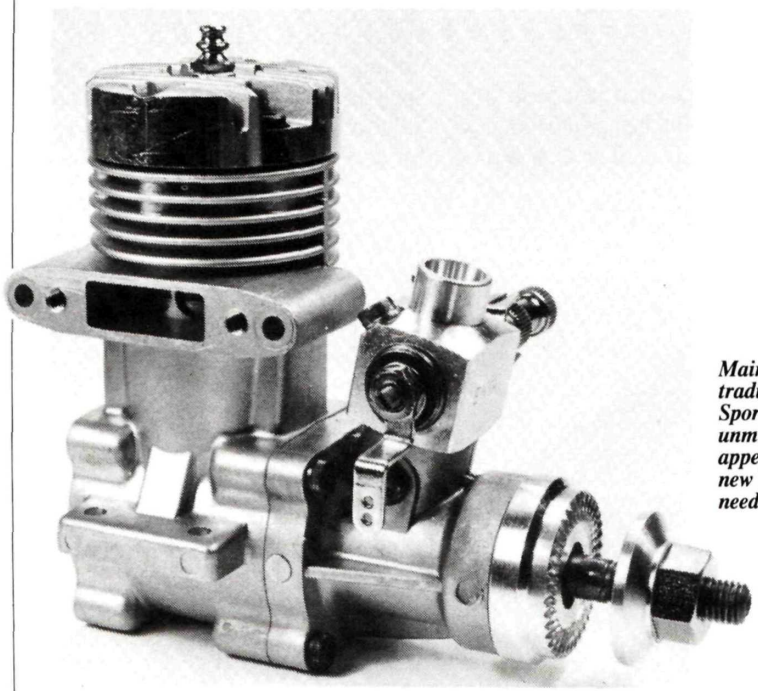
by PETER CHINN

THE ENYA SS (Super-Sport) family of engines now extends to a dozen different models in two basic series. There are seven models in a .25-.30 cu in. group, collectively designated Model 4301, based on the same cylinder-block/crankcase casting, and five models in a larger group covering .40 to .50 cu in. displacement, based on a common main casting, carrying the number 6301. Most of the smaller engines, ranging from the plain bearing SS-25 to the top helicopter model SS-30, have already been dealt with in these columns.

The SS-45 that is the subject of this review is the middle model in the larger range. The base engine, the SS-40, has a plain bronze bushed main bearing and uses a lapped cast-iron piston running in a hardened steel cylinder liner. The carburetor is a standard barrel throttle type with an adjustable airbleed for controlling idle mixture strength. Next up is the SS-40BB which retains the ferrous piston/cylinder combination but replaces the bushed main bearing with two ball bearings and also offers the choice of two automatic

SPECIFICATIONS

Type: Air-cooled, single-cylinder, side exhaust two-stroke-cycle, with crankshaft rotary-valve and Schnuerle scavenging.
Bore: 22.3 mm (0.8780 in.)
Stroke: 18.9 mm (0.7441 in.)
Displacement: 7.382cc (0.4505 cu in.)
Nominal Compression Ratio (full stroke): 10.8:1
Speed Control: Enya TN-131N adjustable automatic mixture control carburetor. (Enya G-Type automatic mixture control type optional.)
Checked Weights: 313 grams (11.0 oz) less muffler; 393 grams (13.9 oz) with Enya M402X muffler.
Mounting Dimensions:
Crankcase width: 33.6 mm
Length (from prop driver face): 84 mm
Height above CL (less glowplug): 68 mm
Bolt hole spacing: 42.5x18.0 mm
Manufacturer's Claimed Power Output: 1.1-1.25 bhp at unspecified rpm. (See text.)
Manufacturer: Enya Metal Products Co. Ltd., Nerima-ku, Tokyo 176, Japan.
U.S. Distributor: Altech Marketing, P.O. Box 286, Fords, NJ 08863.



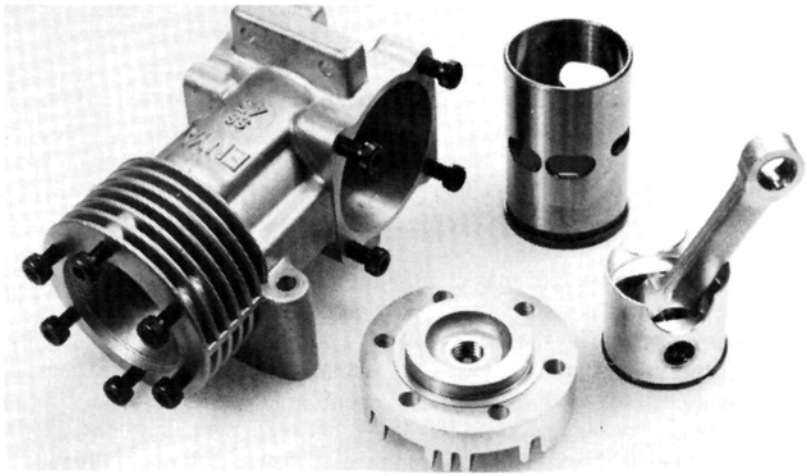
Maintaining a tradition, new Super-Sport 45 is unmistakably Enya in appearance. Carb is new TN-131N two-needle type.

mixture control carburetors. The remaining 40 version, the SS-40-Ring, differs only in its use of a ringed aluminum alloy piston, and the SS-45-Ring is essentially an enlarged bore (22.3 mm instead of 20.9 mm) version of the 40-Ring. The SS-50H, a helicopter engine, has its stroke lengthened as well (20.6 mm instead of 18.9 mm) and is available in two variants, one with the TN-131H two-needle carburetor and the other with the more complex GM9SB carb.

The design and construction of these larger model Enya Super-Sport engines are very much along the lines of the smaller series and they are readily identified as belonging to a long line of Enya front rotary-valve motors. As in nearly all previous Enya two-strokes, dating back to the nineteen-fifties, they have the cylinder casing in unit with the crankcase, which is closed at the back, and have a detachable front housing.

Despite the "Sport" label, the SS-45-Ring has a "state-of-the-art" specification and is certainly not to be confused with earlier sport engines that were suitable only for low performance beginners' models. Like all the Enya Super-Sport series, the SS-45 has a modern Schnuerle-plus-third-port scavenging system. Its ringed low-expansion aluminum alloy piston is machined from bar stock and has phosphor-bronze bushed bosses for the wristpin to improve wear resistance. The forged high-duty aluminum alloy connecting-rod is also bronze bushed at both ends. The pressure cast cylinder head has the usual bowl-and-squish type combustion chamber, consisting of a shallow 15 mm diameter bowl surrounded by a 3.6 mm wide flat squish-band. The head is held down with six 3 mm hexagon socket cap screws. No head gasket is fitted.

Above: Crankshaft and prop drive assembly, front housing and carburetor. Shaft has 15 mm main journal with two ball bearings. Below: SS-45 main casting, head, liner, and piston/rod assembly.



The sturdy crankshaft has a 15 mm o.d. main journal and a 6 mm crankpin on a substantial crankweb. The shaft is bored a generous 11 mm for the gas passage which is fed from a 14 mm long rectangular valve port. The shaft is supported in an NSK 15x28 mm 10-ball steel-caged ball-journal bearing at the rear. As is often the case, this metric main bearing size is coupled with an Imperial size (3/8x7/8 inch) bearing at the front—in this case a 7-ball steel-caged shielded type, also of NSK manufacture. Both bearings are contained in a pressure cast housing that is secured to the crankcase with four 3.5 mm socket head cap screws. Ahead of the bearing, the shaft has two diametrically opposed flats to which the machined aluminum prop driver is keyed.

As in the case of the two ball-bearing SS-40 models, the SS-45 is supplied with either an Enya G-Type carburetor or one of the new Enya TN-131N two-needle carbs. The former type, as Enya users will be aware, features fixed automatic fuel metering plus an airbleed screw for fine-tuning the idle mixture. The TN-131N, on the other hand, is of the two-needle type, the secondary needle being used to regulate the fuel flow at idle speed, after which it automatically releases an increasing flow of fuel through the jet as the throttle is opened.

The standard muffler for the SS-45 is the Enya M402X type. This is an orthodox expansion chamber having a volume of 70 ml and an outlet nozzle area of 53 sq mm. Alternatively, the SS-45 can be fitted with an Enya TM 40/50 tuned muffler. This can be expected to release about 20 percent more power than when the standard muffler is used.

The factory rates the SS-45 at between 1.1 and 1.25 bhp but without specifying the rpm at which this is achieved, or on

(Continued on page 70)

R/C News

by ART SCHROEDER

A DESIGNING point of view. Every time I talk about the Eyeball and the in-line philosophy (wing to stab to thrust) that it's based upon, I receive letters that question my competency, credibility, and sanity. If I suggest that three major flight components can be successfully placed on the same datum line, I inevitably gore someone's sacred cow. All this is a result of some words and a drawing on the upcoming Ultimate Eyeball. Typical comments range from, "The stab is always in disturbed turbulent air and the airplane will 'hunt' for a level position," to "If this is such a great idea, why aren't all pattern airplanes arranged in-line?"

I've often expressed my thoughts on pattern design and said that an airplane intended for pattern should be aerodynamically similar when upright or inverted. This is based on the belief that pattern planes spend half their lives in an inverted position.

Take a simple maneuver like an inside loop. Half the maneuver is in an inverted (or approaching inverted) position, half is upright. The same is true of the roll series; pattern airplanes are snapped inside and outside. In short, pattern planes look quite similar inside and outside and should feel the same forces in both modes.

If this is true (and it is), why would anyone shy away from the one force arrangement that gives equal flight force both upright or inverted? I can't answer that question.

Let's look at conventional reasoning. The stabilizer operates in turbulent air when it's directly behind the wing. Is this correct? Is turbulence something which follows a straight line from the wing trailing edge? Or does it fan out, causing greater areas of turbulence above and below the wing datum line? If so, most stabilizers on pattern ships are in the wrong position! Can wing turbulence be more of a factor than the spinning, precessional forces produced by the propeller?

Finnish PIC 11 "Tumppu" of which several examples have been scratch-built, this one is powered by Homelite 1.6 engine.

All stabilizers work in turbulent air, with the possible exception of T-tail airplanes. I can recall Charles Hampson Grant saying at a Westover Nats that the worst position for a stab was a T-tail configuration. I believe he was right; those big birds don't fly *because* of their configuration, they fly *in spite* of it!

I don't claim to be an expert in aerodynamics, I only say this because I've spent a lot of time around airplanes, "What looks right, flies right." I look at an in-line design and see something inherently correct, and the results seem to bear out my assumptions.

Take a look at those full-scale planes that have been so successful in international competition. For quite some time, biplanes won most of the events. They're really in-line designs: each wing equidistant from the thrust line and a stab in-line with thrust. Upright or inverted, the hot biplane was aerodynamically equal. It was followed by the myriad variations of the Laser; so tell me that in-line doesn't pay off!

How 'bout the latest "innovations" in pattern design? If anhedral in the stab is just right for a pattern plane (a really bad idea), how come dihedral isn't just as good? That's what's happening when it's inverted. When the Curare (or one of its spin-offs) goes inverted, its anhedral stab suddenly develops dihedral. How come that makes sense in pattern flying? If a low wing is best, why isn't it bad when inverted? If a semi-symmetrical airfoil is great upright, why doesn't the style have problems inverted? And if a stab above the wing line is perfect, why doesn't it cause problems for half the pattern? I can find numerous problems with the asymmetrical school of thought. I believe the equal aerodynamic design of the Eyeball is the only way to go to an "ultimate." You'll have a chance to hear about it on these pages soon.

While I'm at it, let me ask a few more questions. How come an upright engine (four-cycle or two-cycle) isn't at jeopardy when an airplane is inverted? How come adjustments to trim dihedral don't mess up inverted performance? Why do we say retracts improve performance when we leave large wheel holes that create turbulence? Shouldn't we begin thinking about equal fin and rudder area above and below the thrust line?

Once again, I don't have the answers, but I expect that some readers do, or at least, may think they do. I invite inquiries to the above questions. Who knows, we might find the ultimate in pattern design.

(Continued on page 102)

Field & Bench Review

GM Precision Products

SUNBIRD 40

FOR THOSE OF US who to the point in flying experience that we're bored with trainers, the need for something that's fun and sporty is very real. We need something which presents a challenge (though not too much) and will survive anything we can wring out of it in the sky. This is the basic definition of today's sport pilot and his desired aircraft; he needs this type of bird.

Thankfully, about 75% of all pilots fit this category, and of those pilots, a good majority of them own a .40-size motor. This is the largest group of model pilots around. And for them is the subject of this review, the GM Precision Products* Sunbird 40.

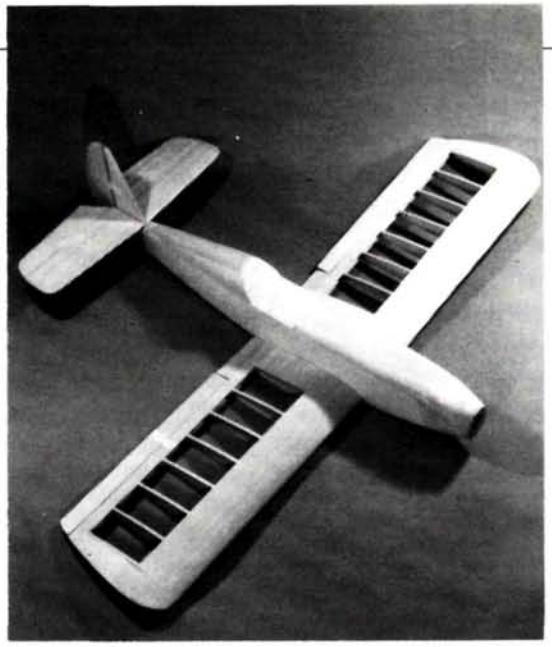
The Sunbird is a low-wing sport bird for .35- to .45-size motors. It has clean lines and sporty looks which are distinctively its own. The basic design is a taildragger and it requires four-channel control. Let's take a look at what this bird has to offer.

THE KIT. The Sunbird kit is an all-balsa-and-ply airframe, and all parts are machine-cut

Graceful lines and sturdy construction make for an excellent sport plane.

by MIKE LEE

SPECIFICATIONS
Type: *Sport*
Wingspan: *52 inches*
Weight: *4½ pounds*
Wing Area: *572 square inches*
Engine: *.35 to .45 two-cycle or .60 to .80 four-cycle*



Finished airframe. Up to this point the Sunbird looks pretty funny until the canopy is added. After that it becomes a snazzy sport bird.

with incredible precision. Included in the kit is a complete (and I mean complete) hardware outfit, plus some very nice illustrated instructions. The wing is a symmetrical airfoil design using modified D-tube construction and a heavy reinforced spar. The fuselage is a standard box with built-up turtledeck. The tail feathers are all-sheet.

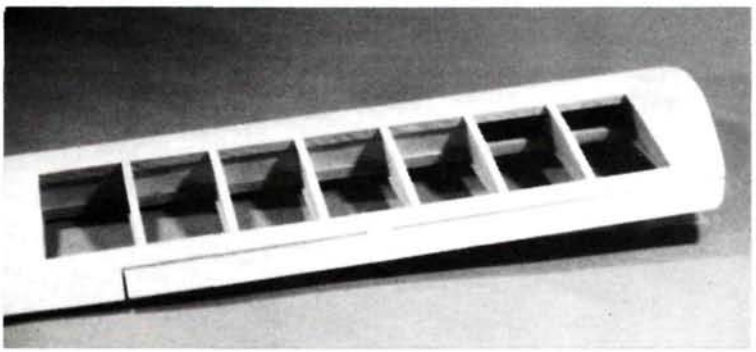
CONSTRUCTION. I began construction with the wing. You can follow the instructions (which are quite good) or you can follow my method which is very fast. After seeing what I had for ribs, I figured the wing was a piece of cake—and it is!

Start by laying the lower main spar down on the plans and find enough ribs to populate it. Place all the ribs down on the main spar using the plans as a guide. All of them will stay right where you put them—without glue! They don't crunch, wiggle, or sag, and they don't overrun the spar. They fit perfectly. Add the shear webs next, they'll stand up all by themselves between the ribs. Now add the top spar and glue it. For this task I used Satellite City* Hot Stuff and Hot Stuff Super T. In fact, the whole bird is put together with Hot Stuff.

Upon completion of the wing half, add the trailing edge stock and leading edge stock. Once dry, top and bottom sheeting can be added, as well as center-section sheeting. Do the wing tip last and this half is done. The process repeats itself on the other wing.

Once the wings are finished, add trailing edge aileron stock. Hardware for the ailerons is supplied, as well as two types of hinges to use for the ailerons. Join the wing halves together at the center with slow epoxy and fiberglass cloth. Sand and cover as you wish. *(Continued on page 104)*

Finished Sunbird shows classic sport lines in a .40-size package, reminiscent of EEA-type home-built aircraft.



Bare bones of wing reveal strong structure. Note that the shear webs pass the midpoint of the wing spar. Rapid construction.

EZ CAP 21

(Continued from page 40)

Incidentally, Repla-Tech provides three-view drawings as well as color photos of the CAP 21.

Detail can be added to the landing gear by simulating with narrow strips of black tape the straps that hold the brake tubing in place. Scale detail can be added to the cowl, such as the under-cowl oil-cooler air intake and the four chrome exhaust stacks from the Lycoming engine at the cowl bottom. I also installed a VHF radio antenna at the rear fuselage top, but it kept breaking off so I bagged it. I also prepared a scale prop with white safety stripes on the tips and Hartzel propeller decals on the blades.

Other areas you can dress up are the canopy and cockpit. Decal-type stick-ons are provided for the instrument panel and aerobatic reference lines on the canopy replicating those used to help the full-scale pilot in maneuver orientation. I also added a pilot replete with sunglasses and shoulder harness. So there are lots of things you can do to add scale features to the model.

My engine selection was a Webra 61, which turned out to be more than enough power. Because I wanted to fly with the wheelpants, a black top surface was in order.

FLYING. The first takeoff was straight as an arrow. I adjusted the elevator trim and then had fun. The CAP flies well and straight, which I attribute to paying attention to the assembly procedures. It's certainly not a beginner's airplane because it flies quickly—you can really chew up the sky and any maneuver you know how to do, the CAP 21 will perform. It certainly is a good looking model, but I would recommend it for a seasoned flier.

**The following are the addresses of the companies mentioned in this article:*

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Repla-Tech International, 48500 McKenzie Highway, Vida, OR 97488. ■

Aerial Artwork

article and p

STAGGERWIN

IT'S DIFFICULT, if not impossible, to explain to people not so inclined what it is that can make grown men sit around and look at a machine for hours on end, never becoming bored. It's even more difficult to describe why some machines engender that kind of visual/emotional impact, while others can be ignored as easily as a bail of hay. The difference separates the classic and legendary from the mechanical also-rans of the world.

It's quite possible that, without meaning to, those of us who find ourselves fixating on an

otos by BUDD DAVISSON

G

inanimate lump of iron or combination of tubes and fabric may be labelling these objects as "works of art." We're seeing something in their lines that far transcends their utilitarian function. We're seeing something in the form that gives us as much pleasure to gaze upon as a Goya or Renoir does to the two-dimensional art lover.

It takes zero thought to conjure up mental images of those machines that are universally accepted as works of art. Who can gaze upon the lines of an 1861 Army Colt and not appreciate its subtle combination of curves and lines, ditto the D-type (not E-type) Jaguars, or the DB-1 racing Aston-Martin, or the more oblique expressionism of the Lamborghini Countach.

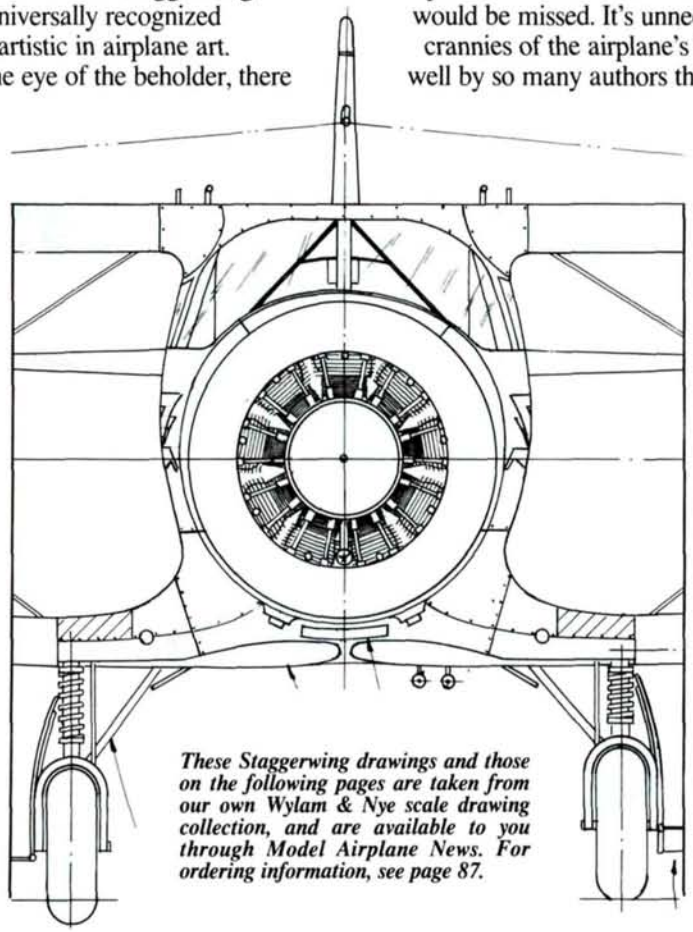
In airplanes the list of mechanical artwork has to be topped by the smooth, flowing form of the Spitfire, with the P-51 possibly running neck and neck for the coveted honors in the military artwork category.

Wars give machines visibility and visibility spreads the appreciation of the artwork of military airplanes, which is probably the only reason why the G-model Staggerwing Beech has not become a more universally recognized symbol of what is beautiful and artistic in airplane art. Although beauty is defined by the eye of the beholder, there are very few beholders who don't think the final variance of the famed Staggerwing Beech is anything less than the ultimate in sensual three-dimensional beauty. When Beechcraft decided after World War II to produce one last variation on the Staggerwing theme, they couldn't possibly know that the small aerodynamic refinements they visited upon the airplane would subtly transform an existing piece of art into a true masterpiece.

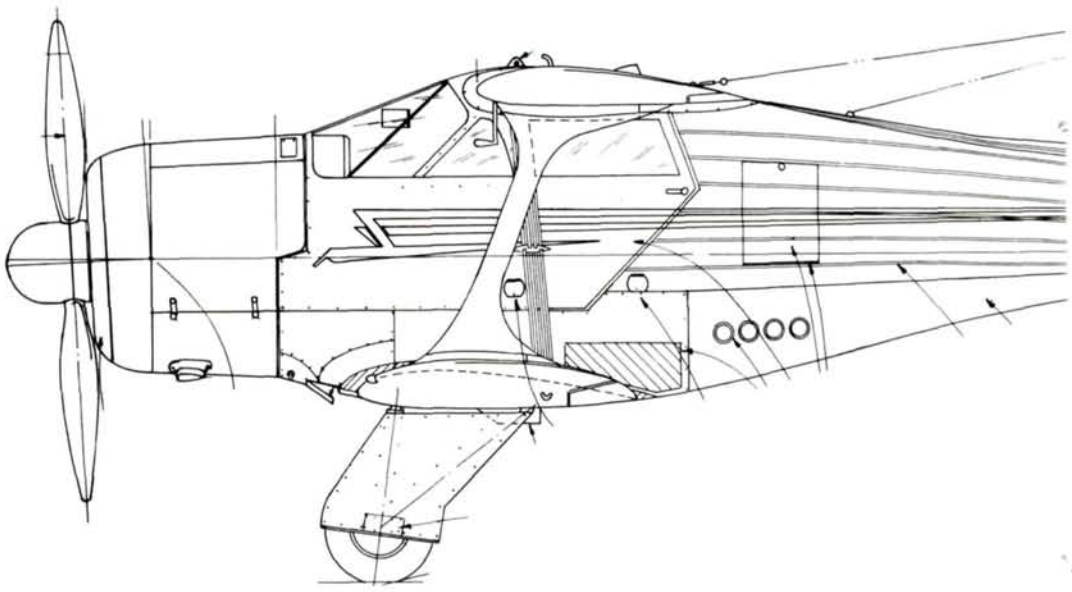
By the time the war had ended, the Staggerwing was about to be overtaken by a multitude of general aviation airplanes, all of which benefited from the wartime acceleration of the technique of building aluminum airplanes. The Staggerwing (technically the model 17) was an unbelievably complex melange of traditional airplane techniques: a zillion pieces of steel tubing were laboriously welded together to form the backbone around which a fragile skeleton of wooden formers and stringers were lovingly crafted by the type of skilled hands that are quickly disappearing today. Its four semi-elliptical wooden wings alone took as many man-hours and as much skill as building a complete airplane such as a Pitts Special. In terms of airplane complexity and required labor, the airplane had changed little since its first flights in 1932 when it startled the world with its outstanding performance and, for then, unorthodox appearance.

It's impossible and unnecessary to recount the total development of the Staggerwing Beech within the confines of a magazine article. It's impossible because the airplane went through many variations and dozens of utilitarian lifestyles before the postwar G17Ss came along and too many important facts would be missed. It's unnecessary to dig into the nooks and crannies of the airplane's history because it's been done so well by so many authors that there are tons of documentary sources for the airplane. However, undoubtedly the very best is *Staggerwing!* written by Robert T. Smith, and published by Cody Publications of Kissimmee, Florida. A quick journey through the pages of this book will give the modeler more information than he knows what to do with and, more importantly, gives irrefutable documentation on paint schemes ranging from the beautiful to the bizarre. Its intense use of cut-aways and interior photos make this particular book an invaluable source of nitty-gritty detail. It also breaks down the changes in the many different models, which allows the modeler to take any given Staggerwing kit and change it to fit anywhere within the airplane's 14-year production span.

When the Staggerwing Beech first appeared in 1932, it sported bulbous wheelpants over its semi-fixed gear (the wheels retracted up into the



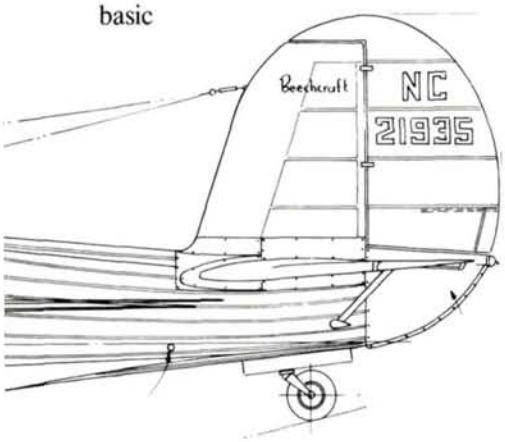
These Staggerwing drawings and those on the following pages are taken from our own Wylam & Nye scale drawing collection, and are available to you through Model Airplane News. For ordering information, see page 87.



pants, the pants did not move). Quickly, however, all Staggerwings featured a rudimentary retractable landing gear that gave the airplane part of its lines and a lot of the performance which made it an immediate success. Although much of the country was hard-pressed to find a buck during the Depression, those businesses which were keeping their heads above water saw in the Staggerwing an incredible business tool which allowed them to transverse large sections of the country in a single bound.

The airplane mutated through several basic airframe refinements which eliminated the tail braces and subtly reshaped the wing tips and vertical fin, but the basic outline and configuration of the airplane remined the same. Every medium to big round engine of the day was stuffed into the Staggerwing's engine compartment and they varied from engines as low as the 225-horse Jacobs, up to 800-horse racing models specially made for the likes of Howard Hughes. However, the most popular engine was the R-985 Pratt & Whitney Wasp Jr. of 450 horses.

The model designation of the airplane has changed as the years progressed, via a numbering system which put letters in front of and behind the basic



Model 17 designation. The prefix letters designate the airframe series and the suffix letters the engine. The most commonly seen combination of these letters would be D17S, indicating a D model airframe with the 450 P&W designated by the S.

(Continued on page 76)

Staggerwing "Amiability" Is Carried Over Into Kit Form

Magnificent 1/5-scale Byron Staggerwing on final.

by CHRIS CHIANELLI

THE GENTLEMANLY flight characteristics of the full-size Staggerwing are carried over into two kits that have stood the test of time. The Royal Products* Staggerwing is a .60- to .80-size kit for the balsa buff. This 56-inch span kit with an area of 907 square inches features sawed parts of the finest balsa. Like other Royal kits, the parts fit is so good that you might think a preliminary sanding has been done. This airplane has shown up on the flight lines of scale contests for many, many years and keeps doing so—there must be a reason.

For those of you who prefer something even larger, Byron Originals* has offered for some time now the G-17S version of the Staggerwing featuring a fiberglass fuselage and foam cores. This 1/5-scale version of the Beechcraft specs out with a 77-inch wingspan and 1,600 square inches of wing area, calling for a Q35 Quadra or comparable engine. In Ceasar Latte's Field & Bench on this kit in the July '84 issue of *Model Airplane News*, he was quoted as saying, "The Byron Staggerwing is surprisingly docile. I was amazed at the slow flight characteristics which were absolutely rock solid. The stall speed was ridiculously slow. With gear down in setting up the approach I put the flaps down and the Staggerwing landed like a feather."

Despite its inherent stability, this is the very same aircraft that's used by one of the Cloud Dancers aerobatic team as part of their breathtaking show. These extremes of flight characteristics prove the Staggerwing is a very versatile aircraft with a wide flight envelope.

Model, or full-scale, the Beechcraft Staggerwing must be considered a story unto itself, with its own chapter in aviation history.

**The following are the addresses of the companies mentioned:*
Royal Products, 790 W. Tennessee Ave., Denver, CO 80223.
Byron Originals, P.O. Box 279, Ida Grove, IA 51445. ■

For you balsa builders, Royal Products has a scale kit of the Staggerwing, which sports a 56-inch wingspan.

SCALE SUNDAY

(Continued from page 37)

braces in the tail. The plane spans 90 inches and weighs 28 pounds. The fuselage is fiberglass, but the wings and tail are foam covered with MonoKote, then waxed with auto wax. The Bud Light decals were not part of the kit, and were purchased separately.

Wayne Siewert's beautiful and smooth-flying Mooney M-20K was designed from factory drawings. It's exact scale, and it's available as a semi-kit. Its wingspan is 88 inches and it's designed for .90 two-cycle or 1.20 four-cycle engines. It features operating flaps and retracts, low-to-the-ground trike gear, and extremely good ground handling.

Most of the more than two-dozen scale fliers were strictly sport fliers who wouldn't think of serious competition. The spectator area was filled with enthusiastic families enjoying a free air show.

Scale Sunday has now become a tradition—Bill Cowette has a talent for such things. ■

SUPER-SPORT 45

(Continued from page 57)

what fuel, or whether with or without muffler. We would guess that the figures relate to the engine less muffler (or alternatively, with the special tuned muffler) and with a moderate nitromethane content fuel. The rpm at which the rated power is reached under these conditions is likely to be around 15-16,000 rpm.

The manufacturer recommends an 11x7 or 10½x7 prop for the SS-45. If larger or smaller props are used, it is worth bearing in mind that these should hold full throttle rpm to between the 8,000 and 16,000 recommended operating speed range. With the carburetor correctly adjusted, one can expect an idling speed of between 2,500 rpm and 2,800 rpm.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

Convert the Midwest Lazy Bird A.R.F. to electric power.

by HAL "PAPPY" DeBOLT

HOW WOULD you like an electric-powered endurance-type airplane which could be assembled quickly? I mean a model capable of long flights and good performance, yet is still an ARF kit, with stock electric power added. Much like the usual engine-powered sportster, there'd be no special design or exotic construction. The powerplant and radio would be "off the shelf," nothing lightweight, special, or modified.

For years Midwest Products* has marketed a foam ARF 2-meter glider kit. I evaluated the prototype Lazy Bird's performance and was surprised to find that this "quickie" glider's flights matched the performance of the usual wooden types.

My entry into electric power came when I converted a large King Condor rubber-powered foam model to electric. I had a choice of using either the Condor or the Bird, but chose the Condor. My success made me wonder about the Lazy Bird.

Now I know how good the electric Lazy Bird is. Would you believe sky-high climbs under power to where the thermals are strong and with reserve power left? With any lift at all, flights were as long as I wanted. This was with the quickest type of kit to assemble and nothing but standard equipment!

Left: Midwest Products Lazy Bird proved to be an excellent choice for electric conversion.

ELECTRO-BIRD

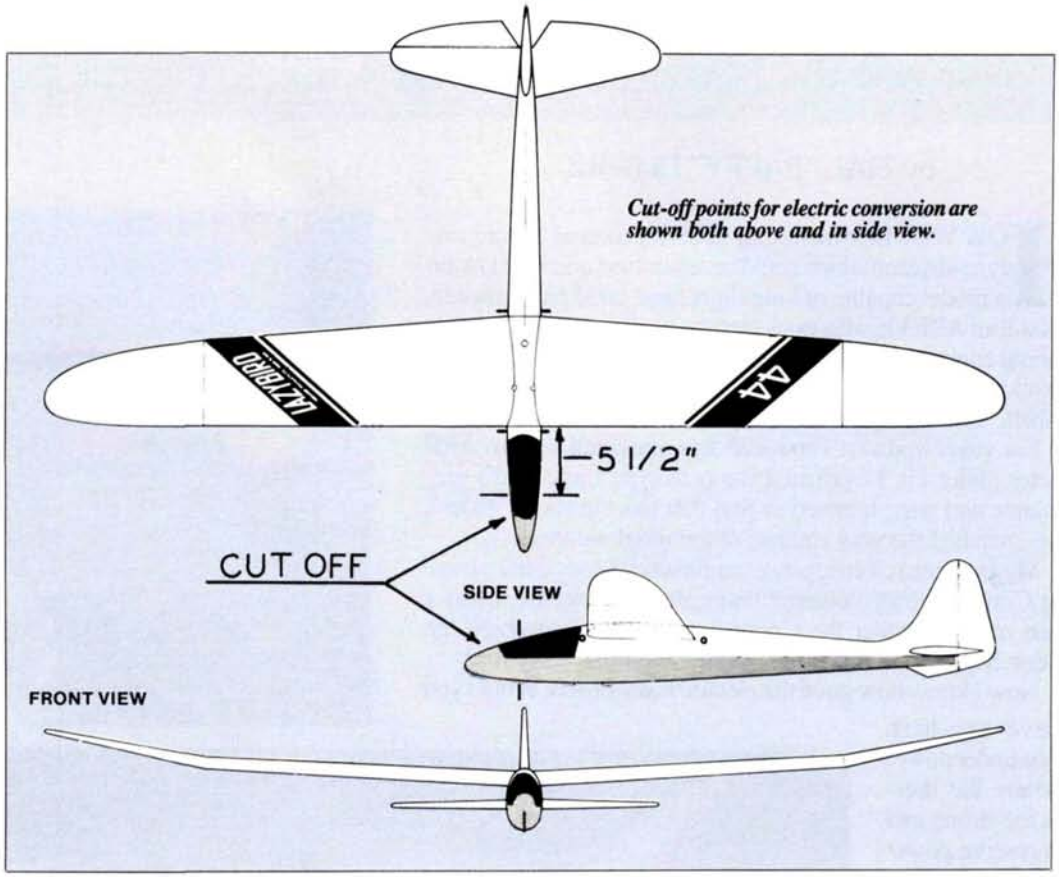
The ARF Lazy Bird structure is all molded foam with only seven finished parts needing to be glued together. Included is a comprehensive assembly manual, which I followed with no problem. All the pieces for the control system, etc., are included. All you'll need to get are epoxy and low-temp covering film.

Any standard (or lightweight, if desired) R/C system should fit nicely. I used a stock pattern system with three medium-size servos and a 450-mA power pack. The third servo was for the motor On/Off via a microswitch. I've found two power systems to give nearly identical results. Basically, I used an Astro* 05C motor with the Astro 2.5:1 belt drive. I also used their switch-charge harness and microswitch for motor control. For the uninitiated, this is an off-the-shelf No. 6505 Astro system with seven 1.2-Ah batteries. I also experimented with a Leisure* LT-50 motor and SR* 1.2 cells with no real difference in performance. For conversion to electric, the Lazy Bird airframe is fine as is. What is required are a motor mount, a balance adjustment, and room for the equipment. Otherwise, follow the instruction manual during assembly.

I found the needed room in the fuselage beneath the wing. The glider version uses this

area for the bolt-on wing-support members. Instead of bolting the wing on, I simply used 3/16-inch dowels and rubber bands. I also gouged all excess foam supports, etc., out of this fuselage area, leaving a 3/8-inch wall thickness. This is more easily done before joining the fuselage shells. I followed the manual for the rest of the assembly and added a few modifications after joining the air frame.

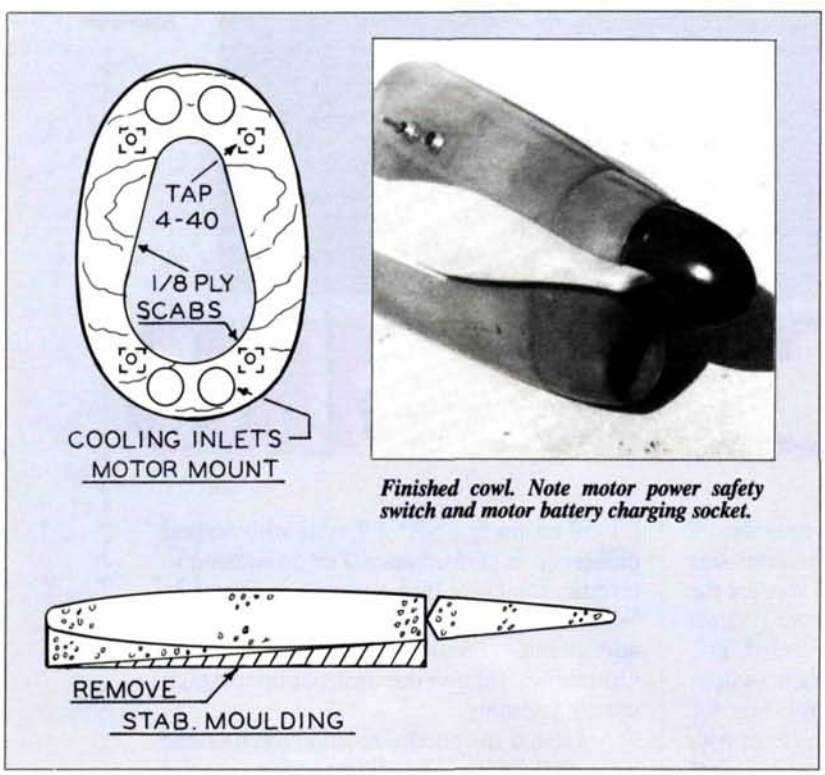
For servo mounting I used 1/4x3/8 maple cross pieces between the spruce stringers in the bottom shell, and installed these before joining the shells. I kept the servos as far aft in the compartment as I could.



Cut-off points for electric conversion are shown both above and in side view.

I shaped the motor mount per the template from 1/8-inch aircraft birch plywood. After squarely cutting off the nose of the fuselage 5½ inches from the wing leading edge, I attached the ply mount with epoxy. I tapped the ply mount 4-40 for the belt drive attachment screws. Small 1/8-inch ply "scabs" on the inside created a 1/4-inch thickness for the screw threads. This has proven most reliable and no blind nuts are required.

I did make one aerodynamic change for this powered version. The glider has the wing set at 3° positive, which is fine, and the foam moldings set the stabilizer at about 0°, basically free-flight-style settings. I envisioned a possible problem when adding power to the design. When turning power on in flight, I would like the plane to continue along the same flight path with no nose-up tendency and no need to retrim. To assure this, I changed the stab setting to 2° positive, which was simple to do. The stab molding has a "fill block" on the bottom used for fuselage attachment. I found that if the forward edge of the fill block is left as is, you can remove some foam on a diagonal to the stab trailing edge. Remove the thick aft edge; this simple change creates the desired stab setting. Once the stab is attached to the bottom, there is a gap between the top of the stab and the fin molding. Fill this in with scrap foam.



Finished cowl. Note motor power safety switch and motor battery charging socket.

Assuming you have all the foam assembled, it's time to think about protecting it from dings and perhaps adding a little color. With electric power there is no worry about fuel contamination, so the foam can simply be painted with epoxy paints. However, the model probably already has some dings from handling and imagine what it would be like after a few flying sessions: the surface

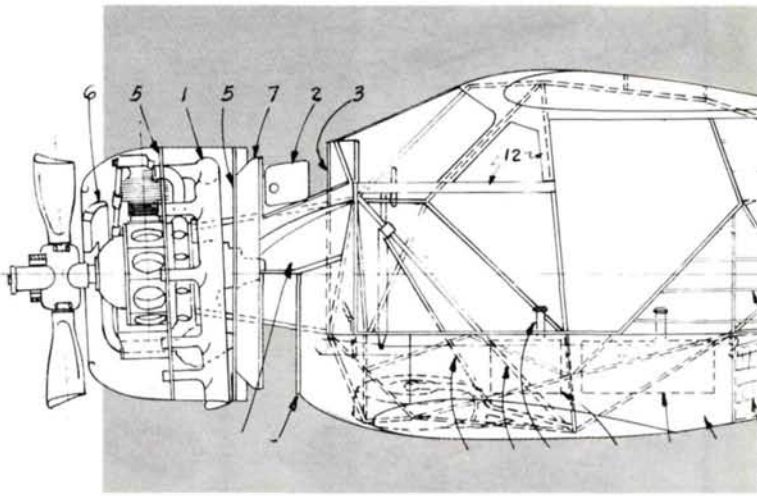
(Continued on page 96)

(Continued from page 69)

Certainly the reason the D17S is the most commonly seen Staggerwing is the fact that so many of these models were impressed into the armed forces during World War II and hundreds more were produced both for our military and those of foreign governments. Hardly an Allied embassy or headquarters staff existed during the war that didn't have at least one D17S painted up with international markings and serving as the personal airline for VIPs. This wide, multinational use of the airplane, as well as the use by both the Army and Navy of our own country, is one reason why there are so many different paint schemes available for documentation. They range from the blue and grey of Navy GB-2s to extremely attractive camouflage schemes utilized by other nations.

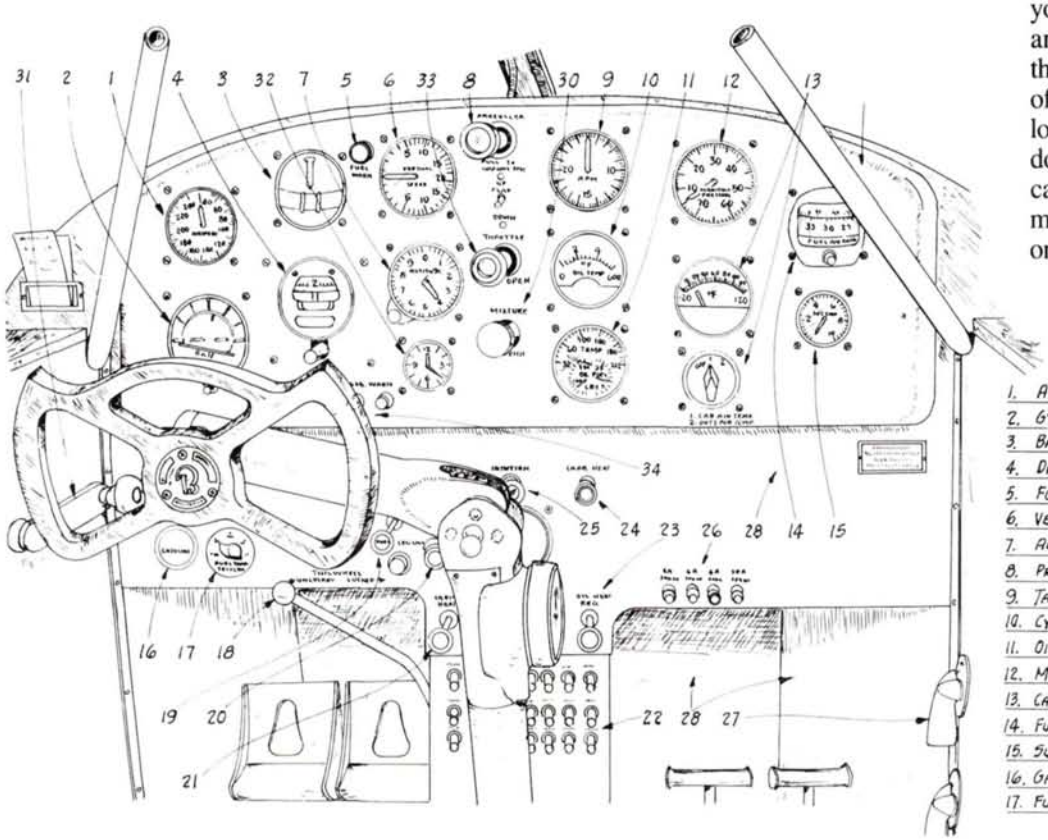
When the decision was made to produce a final batch of approximately 20 airframes in 1946, an effort was made to upgrade the performance via the aforementioned subtle refinements. The most noticeable of these is the reshaping of the cowling so it flows into the boot cowl at the base of the windshield. This tiny change eliminated a break in the airplane's lines caused by the shorter D Model cowl and made the fuselage into one flowing form. Other small changes included one-piece gear fairings and a minor outline change to the vertical tail surface. Many other changes were incorporated into the G Models, but these will be the most noticeable.

According to the specifications, a G Model Staggerwing was supposedly capable of 212 mph top speed, and a shade over 200 mph in cruise. Today the most truthful of Staggerwing owners say that in reality they are only cruising in the mid-190s, which is still boogeying for an airplane with that many wires and wings.

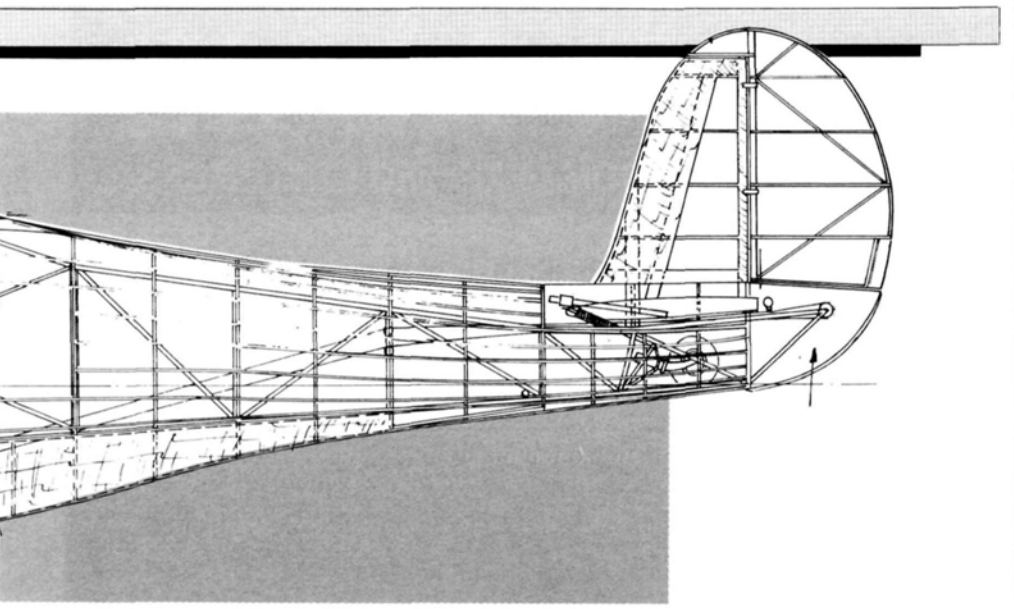


Certainly one of the most lasting validations of an artwork's quality and appreciation is its increasing price as the years go on. By that standard, the Staggerwing is a true functional part of the art world, since price escalation over the last 15 years has put pristine examples of the G Models up into the $130,000 to $150,000 range. The less powerful early versions run in the $60,000 to $100,000 bracket—not bad for a piece of artwork that 10 or 15 years ago could be had for $20,000!

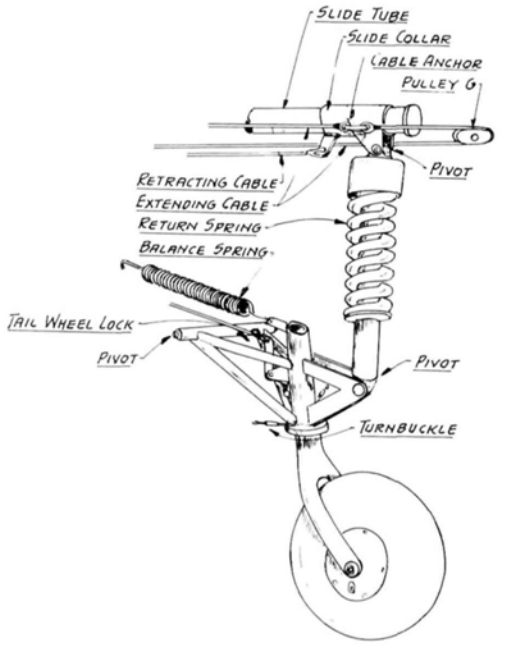
But there is a side benefit to artwork of the Staggerwing variety: you can't climb into your Renoir or your Goya and fly to distant points of the globe and be guaranteed of drawing a crowd of art lovers every time you touch down. The finest da Vinci can't give you the thrill of moving the throttle forward on 450 horsepower and



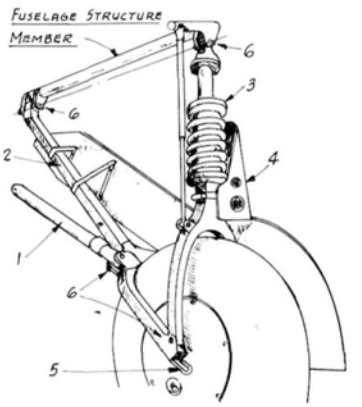
1. Airspeed
2. Gyro Horizon
3. Bank & Turn
4. Directional Gyro
5. Fuel Warning
6. Vertical Speed
7. Altimeter
8. Propeller Pitch
9. Tachometer
10. Cylinder Temp.
11. Oil-Fuel Press.
12. Manifold Press.
13. Carb. & Outs. Air Temp.
14. Fuel/Air Ratio
15. Suction Gage
16. Gasoline Sight
17. Fuel Tank Select.
18. Tailwheel Lock
19. Parking Brake
20. L/G Retract. Sw.
21. Cabin Heat
22. Fuse Panel
23. Oil Heat Control
24. Carb. Heat Cont'l.
25. Ignition
26. Spare Fuses
27. Fuel Tank Sw.
28. Metal Panel
29. Uphol. Panel
30. Mixture
31. Retract. Crank
32. Clock
33. Throttle
34. L/G Warning



feeling it pushing you down the runway and into the air. However, like the great masterpiece paintings, the Staggerwing has a tangible connection to a history and a time when craftsmanship and beauty were a standard in all things and it's important these types of masterpieces survive.



By the way, modelers in the south central United States would do well to find Tullahoma, Tennessee. It's about an hour south of Nashville and it's the home of the Staggerwing Association's museum. Not only do they hold an annual fly-in there each year, in which a great proportion of the nation's Staggerwings are on display, but their museum has on permanent display a number of Staggerwings of various models and an outstanding library where documentation photos and information can easily be found. For more information on the museum, contact Dub Yarbrough, Box 550, Tullahoma, TN 37388. The folks at the Staggerwing foundation are some of the most helpful on the face of the earth, however they are almost all volunteers and do require some form of financial support to keep the foundation/association/museum operating. When you contact them for photos, please be prepared to pony-up a buck or two to help support their efforts.



There's also a Staggerwing club which produces four newsletters a year at a cost of $15 a year. For more information on this, contact George York, Box 111, Mansfield, OH 44901. ■

Pattern Matters

by MIKE LEE

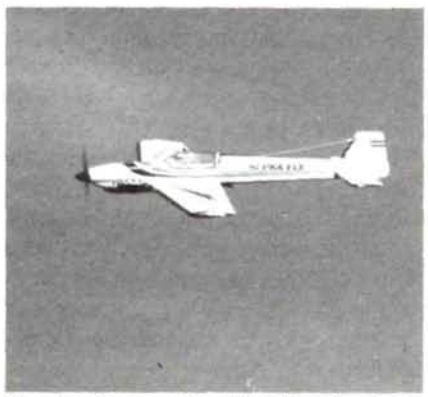
Understanding Tuned-Pipe Setup

AS I WRITE to you this month, we're deep into the final preparations for the U.S. Masters Tournament for Pattern. This, of course, is the meet where the top three pattern aces are chosen to represent the U.S. at the World Championships in France.

I've been doing a lot of talking to pattern folks lately about the present flying styles we participate in. As you well know, we in the States fly both the AMA style and the FAI style of pattern. Recently, however, this system of two styles has started seeing more and more criticism on the worth of continuing the AMA style in lieu of going to a strictly FAI style of flying. For the record, here is my two cents worth.

For the most part, the present AMA classes were created with the specific purpose of providing a stepping stone path to a level of piloting competency that was consistent with the rest of the world. That means that you end up with a generation of pilots who have progressed through a farming system that will produce top-notch pilots ready for world-class competition. Only now, this farming system has a major flaw. It is not producing world class pilots on a level with the rest of the world. Why? Because we fly AMA and the world flies FAI!

This is not to say that our present Masters-class pilots are put to shame by FAI pilots. Quite the contrary, many of the AMA pilots in Masters can out-fly the FAI pilots in AMA competition. But here is where the problem is. They are not comparable.



Breathes there a pattern ship with soul so dead that never to itself hath said, "I need a pipe!"

Dean Koger gets his original Vortex design running. Reached fifth place at Masters.

The AMA wants to continue to raise pilots through the farming system so that they can compete on a world-class level. This can only be accomplished by implementing a farming system which cultivates an FAI-style pilot. This means the AMA will have to start that system at the grass roots level, this being the equivalent of Novice class. From there, the system progresses through a sportsman, advanced, expert, and finally a top class.

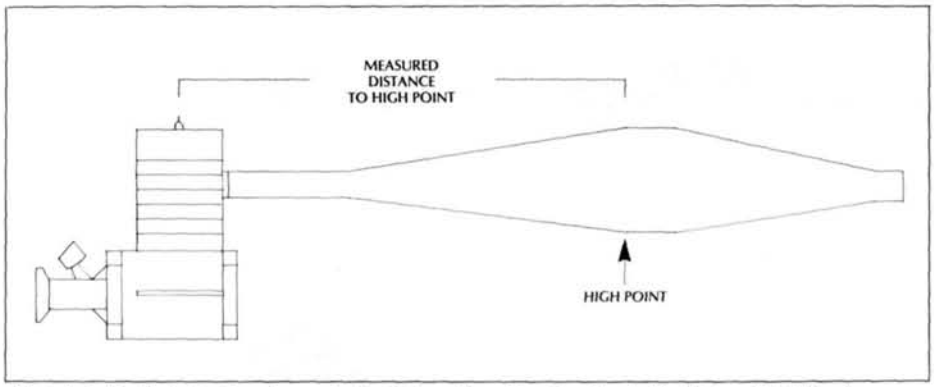
Sure, this writer participates in FAI. But, believe me, I love to fly AMA, and especially love a hot pattern bird that screams Mach 2 speed. What I'm saying is, in order for the U.S. and the AMA to maintain the original intent and spirit of pattern flying, they'll have to transition to a more competitive style of flying. It must be similar to the present style of progression in that pilots are given a stepping-stone path to the top. And it must be gradual enough that the very same pilot in Novice today has the same, equal chance of having a plain-Jane aircraft be competitive without committing to the large expense of a full-blown Masters ship.

Never mind that FAI requires a continuous sequence of maneuvers to be performed, including the maneuvers that return the aircraft to show center. A progressive farming system that begins with a similar style of maneuvers to the present AMA format would be sufficient to get the newcomer interested in the pattern game. Then, once the pilot decides that precision aerobatics is the game he likes, he moves up to the next class of competency, which would then include a limited number of maneuvers that are actually interconnected in the turnaround style. The next level of proficiency would be increasingly more complex, until the pilot reaches the top-most level of full-blown turnaround flight.

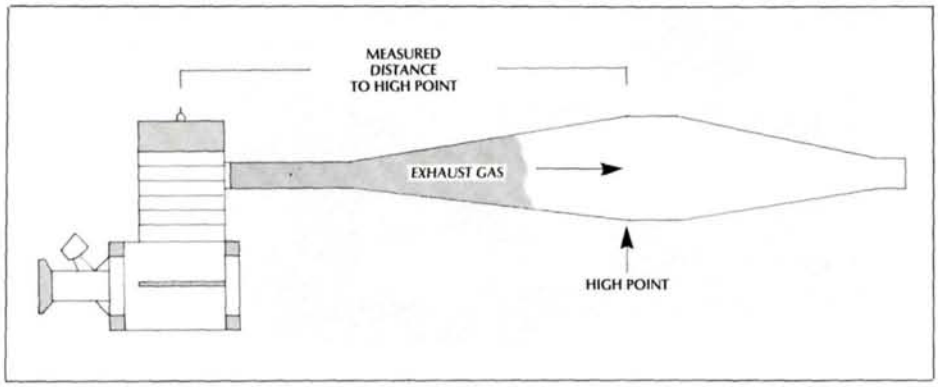
As an example of this progression, let me take a pilot through some steps as I see them.

In the novice class, our pilot would fly the very same maneuvers currently flown by the AMA Novice class. At this level, he has already tasted the turnaround because the first three maneuvers are interconnected—straight flight out, procedure turn, and straight flight back. All the rest of the pattern for Novice remains the same.

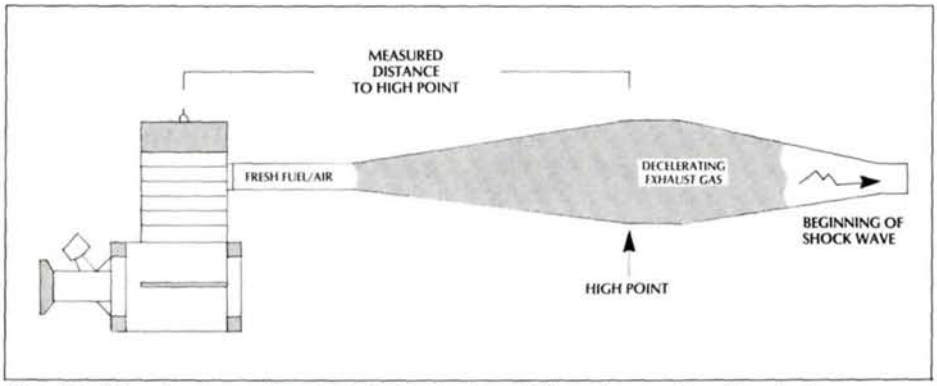
In the Sporting class, the pilot will continue the "terrible trio," only now from the takeoff (as is true for the 1988 schedule for FAI). Once airborne and clear of the first three maneuvers, he may take a free pass, if desired, and then enter the next sequence of maneuvers. Let's say he starts with a stall turn, followed by



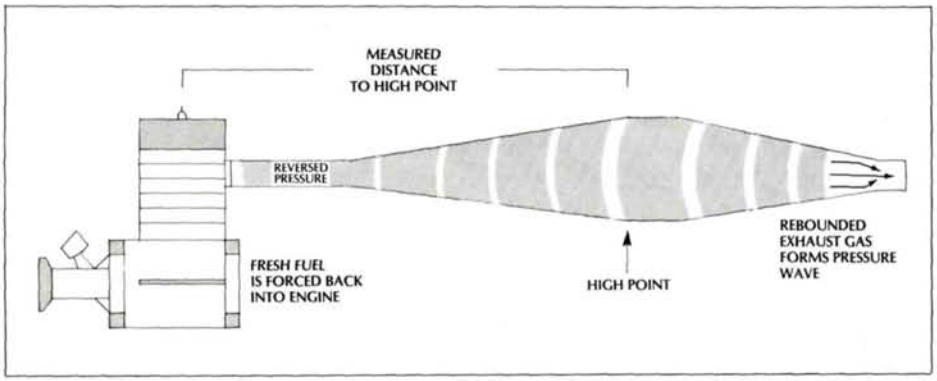
Sketch 1. Typical piped engine; note the distance from the glowplug to the high point of the pipe. This is the correct method of measurement.



Sketch 2. Exhaust gas has been ejected into the pipe and begins to accelerate through the pipe chamber. Gases will accelerate so rapidly that they will pull new fuel/air into the pipe.



Sketch 3. The exhaust gases have started to decelerate and this produces a rebounding shock wave. Meanwhile a significant amount has been drawn into the pipe and the intake port has closed.



Sketch 4. Rebounding exhaust gas forces the new fuel/air back into the motor, producing a super dense fuel/air mixture, which results in more power from the motor.

three inside loops, and then the Immelmann turn. He is up high, but that's alright because now he takes a free pass downwind and sets up for the next sequence. This would continue, the process pitting the pilot in three or four sequences of not more than three continuous maneuvers per sequence. They are fairly easy maneuvers, but the difficulty level is enhanced by tying them together.

This progression in the levels of proficiency would continue through the pilot's career until he reaches the top class—let's let it stay "Masters" class. The farming system has been completed, and our pilot is now on a level of proficiency equal to the rest of the top pilots at that same level. And, we have raised a bunch of competitive pilots who are fully capable of taking on anyone from anywhere around the world.

I realize that I can sit here and fly this word processor, spewing out what seems to be my answer to the world's problems. Believe me, I do this to stir a bit of thought in your head. My solution is probably far from perfect, but it's a start. What we really want to find out is what *you* think. If you have an answer or argument, let's hear it. Maybe together, through this column, we can make the future bright for pattern. Drop me a line, and let's see what we can come up with.

Tech Talk

This month, I want to talk about properly setting up the tuned pipe. This item, more than any other, can separate the good machines from the powerful ones. There is really nothing to the darned things, but they provide a very vital and important boost to our ability to fly with the utmost ease.

First, what happens in the tuned pipe? Basically, the pipe is nothing more than an expansion and conversion chamber for the exhaust. In operation, hot gases from the motor are expelled from the motor exhaust port while still under extreme pressure and heat of combustion. The hot gasses are expanding while they exit the motor, and this causes them to accelerate into the pipe chamber. At this point the pipe is getting wider, and the gases continue to accelerate. At the rear of the pipe, the chamber converges to a smaller volume, causing the gases to decelerate quickly.

If you have followed so far, you're in

(Continued on page 116)

Floating Around

by JOHN SULLIVAN

IN FEBRUARY of '87 I received a letter from Ed Westwood of Spanaway, Washington. This is the same Ed Westwood who wrote two articles for the special floatplane issue. Ed opened his letter by saying that he lived on a lake in western Washington state and was currently flying five seaplanes, with two more ready to go but lacking radios. He went on to say that he was sending the specs on a modified Kadet Senior, and that there were some peculiarities about floatplanes that he wanted to share with our readers.

What followed was a veritable flood of information ranging from thrust to weight ratios, vertical fin area to waterproofing techniques, and design considerations. I've got to admit that I was reluctant to absorb some of this info. In the past I had read about something I wasn't doing

Paul Weston's HP 40-powered scratch-built Delta at Lake Goodwin Float-Fly. Very fast ship.

right, and within a week, disaster would strike.

For example, Ed mentioned that it was a good idea to silicone around the rudder hinges to keep water out of built-up fin assemblies. The very next weekend my ¼-scale Cessna 150 blew over while taxiing back in a high wind. Sure enough, when I pulled the plane into the boat, the rudder was full of water.

The Sig* Kadet Senior is one heck of an airplane. In its unmodified form, it's a big, stable, easy-flying plane that has pleased a lot of modelers, in particular that group of us who left modeling when stick and tissue were king. We've been born again with the Kadet as a trainer.

What Ed did with his Kadet Senior was to turn a trainer into a terror! Ed's specs give some insight to his methods of adding performance while honoring the integrity of the design.

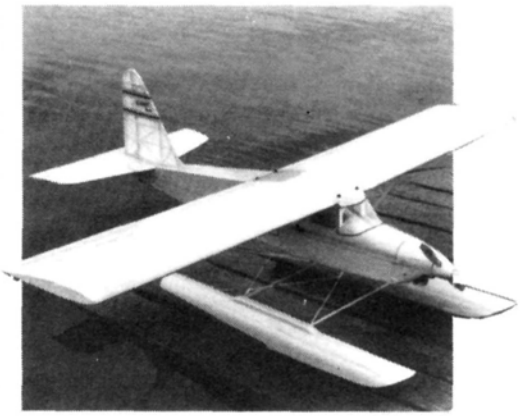
Wing: same area and chord but 15° raked tips, 25% slab ailerons with tip balance, 2412 airfoil, V-struts, 1-inch dihedral total, false LE ribs and Micafilm covering, nylon hold-downs.

Fuselage: ½x3/16-inch spruce contoured wing saddles, all joints gusseted with 1/32-inch ply, additional rear ⅜x1-inch spruce landing gear support, 3/16-inch nylon screw wing hold-down supports, additional firewall support/tank holder, built-up and glassed cowl for inverted HB 61 PDP on nylon mount, Higby smoke valve, smoke tank fixed to cabin floor at CG, Econo-Kote covering.

Horizontal Slab: raked tips with two ½-ounce weights counterbalancing 70% of elevator weight.

Rudder: rounded aerodynamic balance at tip, entire empennage strutted with stranded control line wire at 60% span.

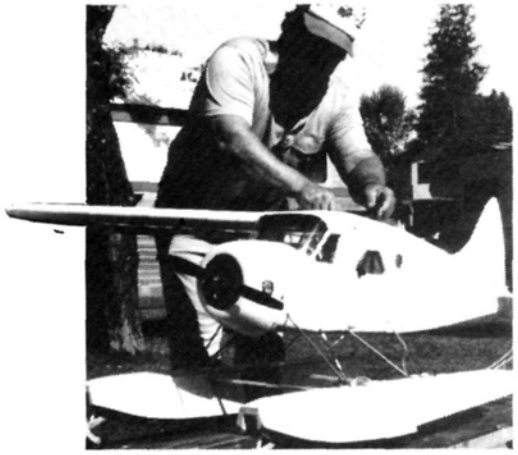
Floats: 40-inch monocoque, V-bottom, ⅛-inch sheet, doped silkspan with polyurethane finish, attach fittings over 5/32 down struts with ⅛-inch N-struts, arrow shaft spreaders, external cable-to-water rudder taped to fuselage with matching plastic tape (this tape works great for spray deflectors too), floats and fittings (2 total), 3x½-inch tapered sub-fin on each float.



Above: Kadet Senior on launch ramp has built-up floats. Note arrowshaft spreaders. Left: Ed Westwood's modified Sig Kadet Senior.

Ed reports that the modified Kadet flies like a ¼-scale with good aerobatic qualities, but because of its 20-ounce wing loading, the plane can wade in for a landing at a very casual 20 mph stall speed. The inverted HB 61 develops 6.1 pounds of static thrust on a 13x5 zinger at 10,100 rpm, and makes for a good clean cowl. However, idling problems in the inverted position have developed and it will most likely be reinstalled as a side mount.

Ed was also kind enough to send along a report on the 12th annual Lake Goodwin Float-Fly. The meet was held at a private resort with Mr. Henry Chapman as the CD. Chapman and his crew organized a great hassle-free week-



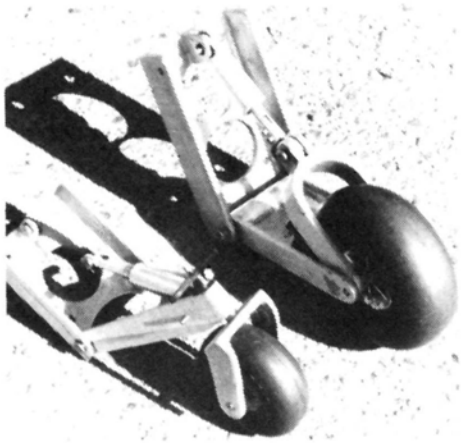
Alan Johnson assembles a 96-inch deHavilland Beaver with prototype retracts.

end. Paul Weston's scratch-built Delta was one of 30 planes at the fun-fly. According to Ed's notes, the Delta came in so slick on its first landing that it dented the dock (the plane was completely unscathed). I'll try to get further information on this bullet for a future column.

In the September '87 issue, I mentioned the introduction of a ¼-scale amphibious retract system. This month, I have some more information for you. The retracts are being manufactured by Jimmy Durham of Custom Castings*, with an assist from Alan Johnston. When I first saw the setup, Jimmy and Alan had installed the retracts in a set of Ken Runestrand's built-up floats, which were hung from a 90% complete Unionville Hobbies deHavilland Beaver and displayed at the '87 Clearlake Fun-Fly.

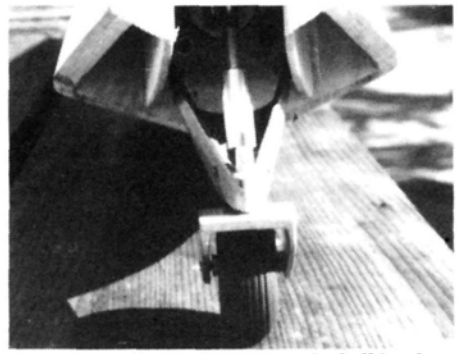
If you look closely at the pair, you'll notice what appears to be hydraulic cylinders which activate the step-well and castoring wheel yokes. These are actually sleeved guides and the system is actuated by mechanical linkage. Jimmy and Alan have installed a Rhom-Air system in the Beaver to provide push. But Jimmy reports that they're experiencing O-ring leaks because their current geometry overextends the throw of the Rhom-Air unit. A fix will entail extension of the throw bellcrank arm, but they're also looking at using a servo-operated jackscrew.

The retract system weighs a scant 15 ounces, including the wheels. Jimmy is currently working on retracts for a 78-inch scratch-built Grumman J2F-6 Duck, with John Barron of Redwood City, California, so he's pretty busy. But he said that the float retract system is available on a *limited* basis. Production of a single set is currently taking two weeks, so if any of you out there just has to have one, I'd suggest you contact Jimmy to discuss the availability.



Castoring bow gear and step-well gear mount directly on float bulkheads.

The next question is, "Where do you get the deHavilland Beaver kit?" The answer: I don't know. The individual who ordered the kit for Alan has moved on, but it's my understanding that Unionville Hobbies operates out of Canada and still manufacturers the kit along with a deHavilland Otter and the venerable Nordyn Norsetrum. These planes have been (and continue to be) the very essence of float flying. If someone can fill me in on the availability of these kits I'll pass along the information as soon as possible.



Bow gear as it attaches to a main bulkhead. Air-operated linkage lowers the gear.

Rich Irwin, who is perhaps best remembered for providing half the fodder for the '86 Clearlake ¼-scale midair, has also taken the plunge into the business end of modeling and has become the proud new owner of P.K. Products*. Rich is handling the Zenoan, Sachs-Dolmar, and Maloney engines along with Modeltech kits, expert radios, NGK plugs, Amsoil Oil, and a host of other goodies.

It's hard to think about it now, but it won't be that long before winter will once again be upon us. Time to retire to the shop and build that new floatplane to make sure it's good and ready when the ice breaks up. Next month, I'll have some interesting items from EDO and more neat floatplanes.

Stay happy!

John Sullivan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this column:*

Sig Manufacturing Co., Inc., Montezuma, IA 50171.

Custom Castings, 7039 Kilkenny Dr., Sacramento, CA 95842.

P.K. Products, 5400 Sobrante, El Sobrante, CA 94803. ■

MASTERS

(Continued from page 44)

popular were O.S. long-strokes, Y.S. pumpers, and Rossi's. Radios were mostly late-model PCMs.

Sunday opened with the best weather of the meet, very low wind and a slightly overcast sky. Soon the sky brightened and the contest began.

You had to be there to know what I'm talking about when I say that these top ten guys could have been mistaken for poker players. During practice earlier in the week, these pilots were the friendliest guys around. However, old buddies and long-time friendships soon gave way to an atmosphere you could cut with a knife.

In the first rounds, disaster struck for Bill Rutledge. His Summit II refused to stay lit. He committed himself to spectator status on the second flameout. Rojecki was having a nasty go of it. Weitz tried hard, but just couldn't match the faster and punchier two-strokes; his Zlin struggling hard to maintain an even keel in the wind. Pappas did his best, and although he didn't make the cut, he came away smiling, as did Jim Bennett. Bennett was flying nicely but was unable to maintain consistency.

The final cut came down to Koger, Hyde, Helms, Frakowiak, and Cunningham. Of these, only one pilot had never been on the team before, the youngster, Chip Hyde. But Chip makes up for his age, being national champ twice.

During the break between finals, both the Tidewater R/C club and the Navy came through again. The Navy gave a neat demonstration of their famed F-14 Tomcats; full-flight-envelope demos were displayed, including a simulated carrier landing. Next, the Tidewater R/C club presented Bob Violett and a dazzling demo of his ducted-fan ships. These were the best flying ducted-fans that I've ever seen.

By the luck of the draw, Frakowiak was up first. His first flight was quite good, staying fairly tight within the box at about 500 feet out. The wind took a little out of the flight, but Tony managed well. Cunningham was next, his flight being carefully placed on the corners of maneuvers, however, his ship was flown low at the bottom of the sequence, allowing the judges to pick up every bobble he made. Still, the flight was the best that Cunningham flew during the entire meet. Koger was the third pilot. His style has changed over the previous years and he's now flying a very swift and fast-rolling style. The Vortex he was flying was about the most precise ship in the air.

MASTERS

Helms came to the line with his powerful Aurora. The speed of the ship was such that Helms had to fly about 600 feet out just to maintain the box. His verticals were awesome, combined with a precise rolling effort. Save for his distance, his flight was pretty darn clean.

Last on the line was Chip Hyde. Chip flew his Aurora in a flowing manner, the corners soft, the rolls very slow. In the preliminaries, he flew crisp maneuvers; but here, he opted for the style that earned him the National title, fairly tight to the box and flowing.

The second flights by the finalists were performed immediately, only in reverse order. Amazingly, not one of the pilots improved their first-round scores. The judges either got very tough, or the pilots fell over and gave up. Nevertheless, these flights decided one final outcome—who was going to be on the team.

If youth were a factor in predicting the outcome, there's no doubt that Chip Hyde would have been on top, and he was! Chip topped the field with a final score of 4990.58. Tony Frakowiak captured the second spot with a close 4965.34. Not even one point off was hard-charging Steve Helms at 4965.14. Gentlemen, that's some flying!

The first runner-up was Bill Cunningham with 4946.43. Only a few points behind him was the second runner-up, Dean Koger. No doubt these two pilots would be ready and willing to perform outstandingly should any one of the top three be sidelined.

As aforementioned, over 60 pilots qualified with credentials to make the cut. Nobody really lost this meet, as all were deserving of the title of Master pilot; it was simply decided who among them would be the best of the best. At the local level, we all try and beat the competition; at the Masters Tournament, we are one body to decide our representatives. With Chip, Tony, and Steve, the U.S. will be quite a team to contend with. Our hats are off to the Tidewater R/C club for their efforts, as well as the Navy and the city of Chesapeake, Virginia. Here's to them and a world champs crown! ■

Landing Gear Struts

by the MODEL AIRPLANE NEWS STAFF

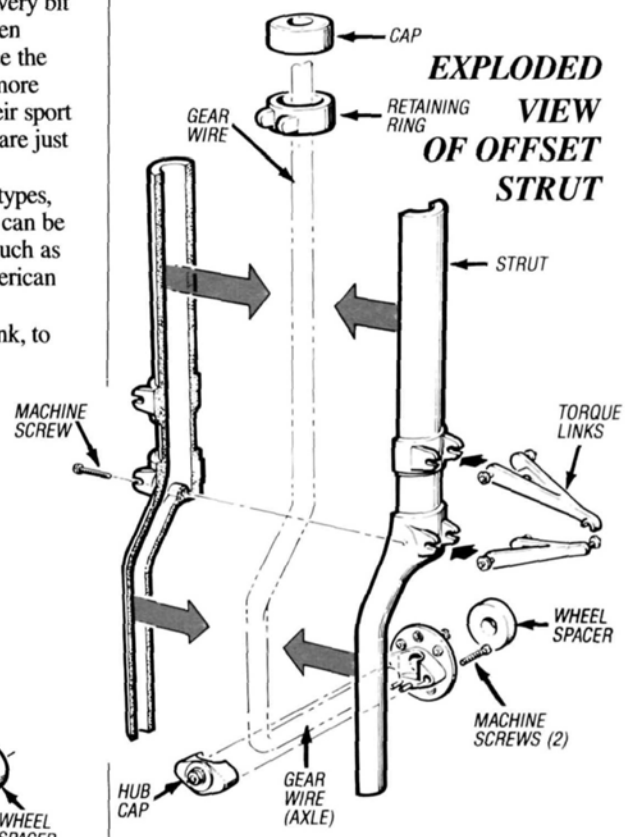
Add that finishing touch of realism with the easy add-on Robart struts.

SPORT FLIERS are in constant search of ways to keep the hobby personally exciting; that is, something that will please themselves, not the judges. It's certainly no surprise that sport scale has increasingly caught the eye of the sport modeler. It's been widely accepted that a good stand-off scale model can fly every bit as well as a sport plane and some even approach pattern performance. Hence the venturous sport fliers are more and more looking for easy ways to dress up their sport scale birds. The Robart* scale struts are just the ticket.

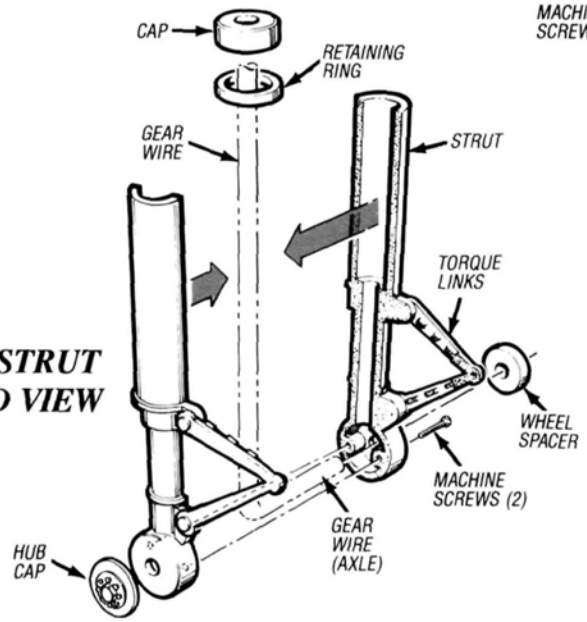
Robart struts are available in two types, straight and offset. The straight strut can be used on scale or semi-scale models such as the Corsair, Curtiss P-40, North American B-25, Supermarine Spitfire, Hawker Hurricane, and deHavilland Chipmunk, to name but a few.

The offset type of strut is ideal for models of the North American P-51, North American AT-6/SNJ—even the Republic P-47 or Hawker Sea Fury with very slight modification, i.e., slight thinning of the lower, offset portion, although for sport purposes this isn't strictly necessary.

The illustration shows how the landing gear door can be attached by drilling through lugs on the retaining ring, then installing a wire door link to pull the door closed as a landing gear retracts.



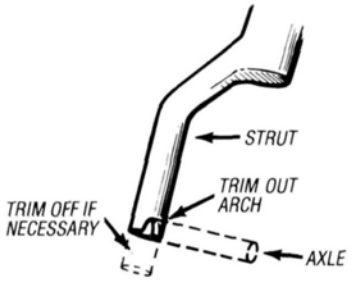
EXPLODED VIEW OF OFFSET STRUT



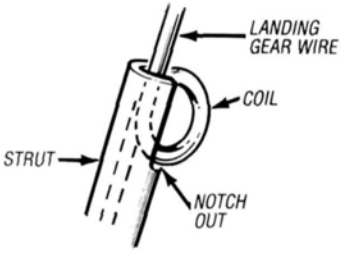
STRAIGHT STRUT EXPLODED VIEW

Study the prototype you're modeling. You might find that the airplane you're modeling doesn't have torque links on its landing gear (in which case you may remove yours by cutting and filing) or the links might point forward or back, so attach your struts accordingly.

Depending on the size of the wheel to be used with the offset strut, it might be necessary to shorten the lower part by cutting off a section. It's also good practice to file or trim (using a No. 11 X-Acto blade) a small arch to fit over the axle.



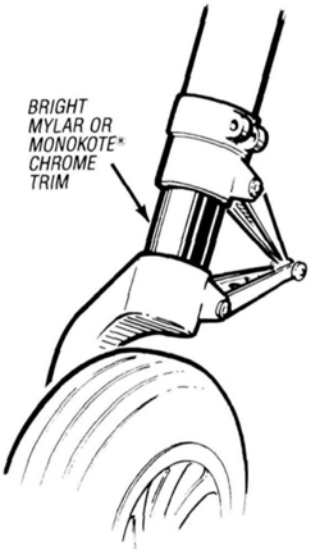
Some landing gears are made with a coil at the top to provide some backward shock-absorbing. Where there is a coil, the top part of the strut can be cut down to finish below it or a notch can be cut to fit around it. There is a bonus gained by the latter—the strut partly hides the somewhat unsightly coil.

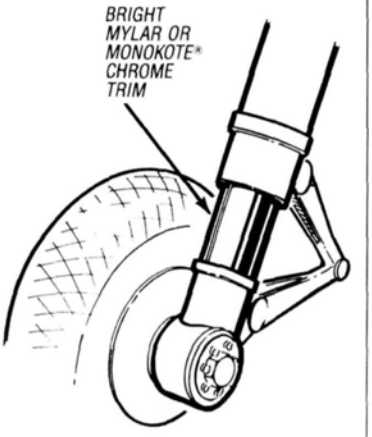


PAINTING THE STRUTS

Painting the Robart strut can only add to the scale appeal, but before doing so the assembled strut should be thoroughly degreased to remove the oil contamination from your skin. Use an old toothbrush and a mild detergent solution, followed by a thorough rinse under running water. A gentle flow from a garden hose works well, but take care if the landing gear is still attached to the model!

Be sure to use paints which are not attacked by model fuel. We recommend hobby epoxy paints or urethane paints, both of which are readily available at your usual hobby store.





CUSTOMIZING

Examine full-size airplanes and you'll notice that the landing gear telescopes in its spring action. The sliding portion left exposed is brightly polished and this is easily simulated by silver paint or, better yet, a strip of chrome MonoKote trim or bright mylar foil (found in packing or greeting cards) glued around the strut using a regular contact cement such as Goodyear Pliobond.

**The following is the address of the company mentioned in this article:*
Robart, 310 N. 5th St., St. Charles, IL 60174. ■

TANGO

(Continued from page 21)

found that a different Black Baron epoxy matched better.

The first steps call for the set up of the engine and mount to the firewall. I went to my friend Dick Purdy to solve this one. (Dick has more inventory in his shop than most hobby stores.) After trying seven different combinations of engines and mounts, we decided upon an O.S.* .35 FP, with an O.S. factory mount (the O.S. .40 FP has the same bolt pattern as the .35). Rather than cut up the cowl, I installed a remote needle-valve, also from O.S.

The servo-mounting trays must be cut to fit your brand of servo, as they are not pre-punched. A small drill (to put access holes in the corners) and a good coping saw are all that are needed. The wood was a high-quality five-ply. Except for the rudder hinges, the only glue I used was PIC* 5-minute epoxy. Be sure to rough-up any plastic surfaces that will be glued, to provide some bite for the glue.

The torque tubes are attached to the wings with plastic "keys" inserted into the foam core, and glued to a slotted edge on the control surface. Be sure to note the deflection of the control levers, at the ends of the ailerons, as they must clear an opening in the side of the fuselage to mount the wings.

I used the provided obechi wing-tip caps, but substituted balsa for the aileron tips. This allowed for sanding a more even match to the wing.

When finished, the wings mount to the fuselage by means of an internal metal strap and an aluminum tube that passes through the fuselage. The method is a little difficult to explain, is very unique, and gives a very clean look, leaving out the ugly seams found on a conventionally mounted mid-wing design.

The rest of the construction is pretty straightforward. The only hardware I substituted was the hinges for the rudder. I felt they were a little too small.

When I finally completed the plane, and added an 8-ounce tank and some wheels, I was delighted. This plane did not look like an ARF (at least not like one in this price range). The CG was right on the mark, and the model literally begged to be flown.

FLYING. Brother Chianelli got to do the honors of the maiden flight. The Tango lifted off smoothly and required no trimming. After only a few minutes of "warming up," the Tango rolled on its back and began showing off. Very little down-elevator was needed to maintain inverted flight. The Tango flew very well and was not a high-speed demon, making it ideal for advanced beginners and intermediate fliers. I do recommend the use of a .40-size engine. The dihedral was a little too steep to allow good knife-edges, and the plane has a little faster sink rate on dead stick landing than would be preferable for the beginner, even though it did not hint at dropping a wing. However, the Tango is not a trainer but an exemplary sport plane and in this respect I surely give the Tango very high marks. I look forward to our next dance.

**The following are the addresses of the manufacturers mentioned in this article:*

United Model Products, 301 Holbrook Dr., Wheeling, IL 60090.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

O.S. Engines, distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

PIC, 943 Stierlin Rd., Mountain View, CA 94043. ■

LAZY BIRD

(Continued from page 74)

needs some protection. You can fill the dings with Dap spackling compound and then block-sand all the foam to prepare for covering.

The manual suggests using a low-temperature covering film. I've had some recent experience with Coverite* Black Baron film, which worked great on a wooden model and was very easy to apply. Because it's low-temperature film, it was an obvious choice for my Lazy Bird wing and tail. I could have used it on the fuselage as well, but I wanted the extra protection and strength that fiberglass gives to this often-abused component. I used about ¼ yard of 1.6-ounce Sig* glass cloth and attached it with epoxy resin. Weight is an important factor with an electric, but you can have a very light glass covering if you're careful.

Apply the cloth by brushing resin through it with a stiff brush. Use minimal resin and brush it out thoroughly! After it dries, sand well with No. 60-grit coarse paper. Then apply a second *light* coat of "micro" (five parts microballoons to one part resin) to fill pores. Sand this until it's smooth. Use a medium coat of paint filler, then sand well with fine paper. A single light coat of color will provide a usable finish. I used Black Baron spray epoxy paint for ease of application and this attractive, protective finish weighed only 1½ ounces!

A preflight check of this bird is simple. About the only airframe check is the balance point. With the 1.2 cells as far forward as possible, the CG should be (as called for) at the aft edge of the wing spar. Otherwise, does the power unit operate properly? Are the batteries freshly charged? Does your R/C equipment check out okay? At range? You should be ready.

A geared system in a big airplane needs a large propeller and the prop choice is even more important with electric power. In this case, diameters in the 11- to 13-inch range are required, with a relatively high pitch of 8 to 10 inches. I've found a 12x9 to work well. You might want to try one of the special electric folding props; I know of one with a 13-inch diameter which should work well.

Before proceeding to the flying infor-

(Continued on page 98)

LAZY BIRD

(Continued from page 96)

mation, I should mention a couple of additions which aren't really necessary, but which have worked well on my Lazy Bird.

I haven't noticed any difference in performance from adding a cowl, but I chose to add one for cosmetic reasons. After chopping the sleek glider nose off, a cowl brought back the beauty of this design and allowed me to add some creativity to an otherwise fixed style. It was also a chance for me to try a jet-style intake like the one used on the F-8 Crusader Navy flighter.

I produced my cowl on the fuselage by placing a 1/16-inch ply spinner ring on the belt drive prop washer, then filling around the belt drive with blocks of foam from the spinner ring to the motor mount. I then carved-sanded the foam to the desired shape and added two layers of glass cloth and resin to add strength and surface to the foam. After removing the cowl from the fuselage, I gouged out the excess foam from the inside. The cowl is attached with a couple of screws. If nothing else, this piece adds a finished, professional look to the Lazy Bird conversion.

I know that I said this was an off-the-shelf project, but I like to experiment and want to share my findings with you. With a Davey Systems* ammeter and a Royal Products* tachometer I conducted some tests on the Lazy Bird.

The results were interesting. With stock Astro 05C and 2.5:1 belt drive using seven 1.2-Ah cells and a 11x8 Y&O Prop, I got 4,000 rpm. drain was 15 amps. Current In flight this was ample thrust to get to thermal altitude and have some reserve power. In light lift this equates to 8- to 10-minute flights; longer, of course, with decent conditions. Remember, this is a large 2-meter plane which weighs a hefty 54 ounces.

I was very impressed by Bill Winter's Heron project as reported in the March '87 issue of *Model Aviation*. His performance vastly improved! One aspect of his concept which might affect this project was the use of a 3.3:1 gear ratio. Actually the change from 2.5 to 3.3:1 is relatively simple with the Astro belt drive. Just substitute a 12-tooth motor pinion gear for the normal 16-tooth gear. The results of this change proved interesting and the performance increase very neat.

A similar static test with the 3.3:1 ratio showed the same 4,000 rpm, but only a 10-amp current drain. This is a drop of 1/3 in current used, with no loss of thrust.

Bill's experiment certainly produced some good results.

The difference in flight has been most enjoyable. With the lower ratio, the rate of climb seems better. With the longer run, the altitude gained became sky-high with more reserve power left. To put it another way, for several flying sessions in a row *every flight* was as long as I wanted and I had to fly down from altitude to end the flight, rather than being forced down by lack of lift or power. About 20 minutes is enough neck-stretching for this cat at any one time!

This simple alteration changed a good-flying, simple electric into an outstanding one with very little effort.

FLYING. Rudder-turn response is positive, but like a glider there is some response time; it's not quick like engine-powered sportsters. Elevator action is more comparable; it's quicker, and trim changes produce immediate results. Once initially adjusted, no trimming should be required for normal flight. The Lazy Bird is adjusted for a flat glide path which is fast for most gliders.

With a bit of back pressure on the stick you can find the optimum climb angle for the circumstances, the angle will be shallow. The climb is usually in circles. For wide circles, little back pressure on the stick is needed—tight circles require more. Of course, once at altitude you can let it fly itself if you like the lazy way!

Without wheels, you'll have to hand-launch. Because it's large, relatively heavy, and fast, a good heave and a clear area are required. It takes a couple of large circles to get going and up to flying altitude. After that, it's a simple circling climb to altitude. In the process you can work it toward any area where thermals are likely to be. Just don't force it to climb faster than it wants to, it takes a couple of minutes to get to altitude.

Landings deceived me at first. I continually over shot the touchdown point before I realized that with a low sink rate and because it's quick, the electric Lazy Bird covers a lot of distance in a short time! I finally convinced myself that it was safe to begin the approach from far out and low down! It penetrates well and now that I know this, subsequent landings have been 10s!

What else can I tell you? Here's a way to fly with electric power, with little expenditure of time or money, and yet still achieve long flights.

**The following are the addresses of the companies mentioned in this article:*

Midwest Products, 400 S. Indiana St., Hobart, IN 46342.

(Continued on page 102)

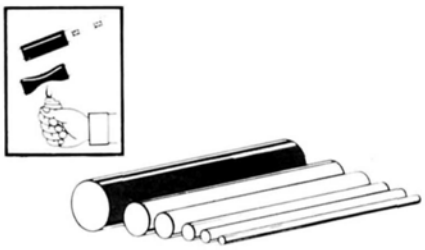
Product News

THE GIPSY MOTH

Aerodrome Models, Ltd. (2623 S. Miller Rd., Saginaw, MI 48603) brings to you the DH Gipsy Moth. It's a gentle, classic biplane that's capable of scale aerobatics. A strong point of the Gipsy Moth is its ability to fly in windy conditions and off floats (for winter and water enjoyment). The Gipsy Moth features a 54¾-inch wingspan and engine sizes range from .45 to .65 four-strokes. The kit includes ABS pre-cut cowl and wing tank, pre-formed landing gear and cabanes, aluminum struts, and complete plans and instructions. Aerodrome kits are precision-cut from select balsa and ply.

MALONEY 125

World Engines (8960 Rossash Ave., Cincinnati, OH 45236) announces a new engine for their line, the Maloney 125. The M-125 has a larger stroke and bore, and weighs about an ounce or two more than the M-100. The coil, flywheel, rear drive washer, carburetor, prop nut, and mounting dimensions are identical to the M-100, but nearly everything else is different. One noticeable improvement is that there are two rings on the M-125, compared to only one on the M-100. This addition makes quite a difference in power. Consider the M-125 for kits that recommend 1.20 four-stroke engines.



NEW FROM DU-BRO

Du-Bro Products, Inc. (480 Bonner Rd., Wauconda, IL 60084) has announced its new Heat Shrink Tubing. This is the ideal solution for many of your modeling needs. It's been specially designed and formulated to shrink up to half of its original diameter simply by using a heat gun, soldering iron, or cigarette lighter. It's ideal for insulating electrical splices and covering electrical plugs and connectors. It comes packaged in 3-inch lengths in 6 different diameters.

SPECIAL 'T'

New Hot Stuff Special 'T' semi-instant cyanoacrylate glue is nearly twice as thick and has almost twice the gap-filling ability as the "instant" slow-type glues in the industry. Special 'T' has a cure time of about 1 minute, providing plenty of alignment time. However, used with Kick-It accelerator, Special 'T' can set in just seconds. The ultra-high viscosity allows large area planking without concern of the glue soaking into the work. If you're called away from your project, it'll sit on the structure for up to 20 minutes. It's so easy to use, it's like building the old-fashioned way—except you decide when you want the cure! What could be easier?

For more details contact Satellite City (P.O. Box 836, Simi Valley, CA 93062).

NEW FROM LOCTITE

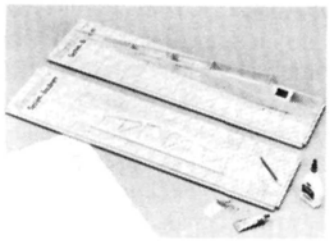
Loctite Corporation (4450 Cranwood Court, Cleveland, OH 44128) has introduced a couple of new products. Loctite 242 Threadlocker is already quite well known. It prevents nuts and bolts from loosening up due to vibration and allows complete disassembly of parts with hand tools. Race car drivers and helicopter pilots shouldn't be without this product. Threadlocker 242 comes in handy and has an excellent shelf life.

Also new is Loctite's Spray Adhesive. This adhesive is convenient and especially designed for hobby use. It's ideal for laminating wood to wood, wood to foam, foam to foam, etc. This product will not attack or ruin foam.

KALT BARON 30 MX

Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109) introduces the new Kalt Baron 30 MX. This high-performance addition to the Kalt line is larger than the average 28-size models, with a main rotor diameter of 48.5 inches. It's considered to be the easiest to fly "compact" to date. With collective pitch, Bell-Hiller mix, auto-rotation, and aerobatic mixers, this model is quite capable of full aerobatics and inverted flight. It's great for both the novice or expert who demands control and performance.

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee of performance by **Model Airplane News.** When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**



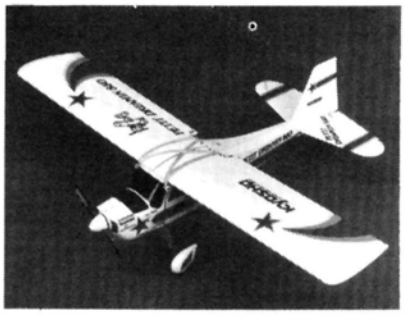
FROM HOBBY LOBBY

Hobby Lobby International, Inc. (5614 Franklin Pike Circle, Brentwood, TN 37027) is distributing the new Graupner Unitized Building Board. This is not just an ordinary building board: it's a building "system." Each unit consists of a balsa building board that's 39 inches long, 9.8 inches wide, and ¾-inch thick, with a ¼-inch slot cut into all four edges, plus two plywood joiner strips. Using the joiner strips, you can connect a second unit to produce a building board that's either twice as long or twice as wide as a single unit; connect three, four, or as many units as you desire. You could pin a 13-foot sailplane wing onto four end-joined units. Printed on the balsa board is a precise grid pattern which is helpful for maintaining the alignment of the constructed parts.

SIG GLOWPLUGS

Sig's new glowplugs are well-made, dependable, and economical. The four-stroke plug has been designed for superior performance in all four-cycle engines. These plugs provide both great idle and exceptional value. The tuned-pipe plugs are cool running and provide good throttle transition from low to high rpm. The standard R/C long plug with idle bar is a good solid plug for both sport and competition flying.

For more information contact Sig Manufacturing Company, Inc. (401-7 South Front St., Montezuma, IA 50171).



FROM GREAT PLANES

Kyosho's new Petit Dreamin 850 is the latest in their series of scale electric planes. With its blow-molded fuselage and pre-covered balsa wings, the Petit Dreamin 850 is both easy to assemble and fantastic to fly. The Dreamin 850 includes a 6-volt, 450-mAh battery pack and charger. All that's needed for operation is a two-channel radio with mini-servos.

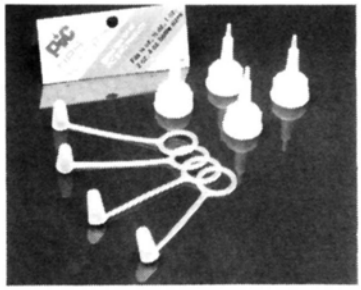
DIGITAL MINI-TACH

Also new from Great Planes is the Hobbico Digital Mini-Tach. This unit provides valuable information that will improve performance and extend engine life. The Digital Mini-Tach has an operating range of 0 to 29,000 rpm, so you'll be able to check almost any engine. Its LCD readout also means you'll be able to read it in direct sunlight. And you can test with either two- or three-bladed propellers.

For more information about these products contact Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820).

NEW FROM PIC

Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) has introduced its new Rigid Yellow Aliphatic Glue. This adhesive is a professional woodworkers' glue. The chemical components are designed specifically for wood bonding and superior results are attained when bonding hardwoods. The density of the cured glue permits easy sanding and produces smooth, professional results. This glue is very high in solids content and offers rapid tack and quick bond strength. Load-carrying parts should be clamped for 25 to 30 minutes and allowed to dry overnight for maximum integrity.



NEW NOZZLES

Also new from PIC is Tips 'N Tops. These are spare dispensing nozzles and nozzle caps for all sizes of PIC STIC cyanoacrylate products. They come in handy when special jobs need specially trimmed nozzles, or when replacing nozzles which have been contaminated with accelerator. Each nozzle cap is secured to the bottle with a cap strap and fitted with a special gasket to prevent leakage. Tips 'N Tops are sold as poly bags of four each (nozzles and caps).

LAZY BIRD

(Continued from page 99)

Astro Flight, 13311 Beach Ave., Marina Del Rey, CA 90292.

Leisure Electronics, 22971-B Triton Way, Laguna Hills, CA 92653.

SR Batteries, P.O. Box 287, Bellport, NY 11713.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Sig Mfg., 401 S. Front St., Montezuma, IA 50171.

Davey Systems, 1 Wood Lane, Malvern, PA 19355.

Royal Products, 790 W. Tennessee Ave. Denver, CO 80223. ■

R/C NEWS

(Continued from page 58)

Byron Strikes Again

On August 24, 1987, Byron Godberson and his organization (Byron Originals) accomplished what the AMA hasn't been able to do in public relations for the sport of modeling in 20 years. The Byron Aviation Expo was covered on *The CBS Nightly News with Dan Rather.*

If you don't think that's important, then you don't appreciate the power of the media. This was nationwide coverage of a modeling event that went into millions of homes and highlighted the adult and sophisticated aspects of our hobby/sport. At last we've gotten a share of public exposure that we certainly deserve!

It was all on the TV screen: the familiar explosions, the combat, a smoking Zero and its escaping pilot. And most important of all, the piece showed our activity as displayed by adults, flying realistic aircraft just for the fun of it. Congratulations, Byron, you've made us proud!

Things We've Used and Enjoyed

If you want a quality spinner, take a look at the ones produced by Tru-Turn*. These aluminum bar stock spinners are as good as I've ever seen. They range in size from 1¾ to 3 inches, with FAI styles in the same range. You can get a spinner cut for props if so desired. The entire line meets most of our spinner needs, so give them a try.

A Second Look

One of the criticisms aimed at our Field & Bench reviews has been the uniform level of praise for the products reviewed. Apparently, some readers feel there's a lack of honesty in the review if something critical isn't said. I've explained this high praise level by stating that most of today's products are quite adequate (at worst), and usually well beyond adequate for the majority of consumers.

The R/C industry has dwindled down to a few survivors who can produce top-quality products for an ever-demanding market. Quite honestly, I can remember when "buyer beware" was a legitimate comment for the hobby product consumer. I've seen engines that were better suited for anchors; radios that rarely worked; wheels that went flat on hot

runways; kits that had parts which apparently were never coordinated with each other; instructions that would have been more useful if written in Hebrew; and accessories which seemed designed for everything but model airplanes. Today's products usually do what is claimed, and if a problem exists, most manufacturers will set things right.

Anyway, I thought it might be worthwhile to take a second look at a kit that *Model Airplane News* covered in a past issue. By their very nature, Field & Bench reports cover only one opinion, and that's over a short period of time; here's a second opinion.

Back in December of '85, Ceasar Latti reviewed a Carl Goldberg Models* Anniversary Edition J-3 Cub. He found the kit to be outstanding, with great parts fit, good materials, super instructions, and fine flying qualities.

Having spent a month with the same J-3, I can only say that Ceasar was right on the money: this is a fantastic kit! Not one part is out of size, based in great measure on lite-ply, dowels, and balsa. The instructions are superb, leaving absolutely no gray areas of doubt for even the novice builder. An excellent force arrangement makes this plane near perfect for low-time pilots, while still retaining the maneuverability of the full-size Cub.

While not exactly to scale (there are some concessions made for building ease), the finished airplane leaves not a doubt that it's a Cub. Wrapped in Cub yellow, even the neophyte would know this bird as a Cub—which brings me to my second reason for this second look.

I used Coverite's* Permagloss to finish this Cub. Even though this material has been available for years, I'd never used it before. I'd heard some negative comments about its ease of application and stability. But what I heard was wrong. With a little practice, Permagloss is as easy to use as any covering and, when complete, there's a fuel-proof fabric result.

However, applying Permagloss correctly requires that you learn a few things. Keep a lot of sharp blades around; this polyester material dulls edges fast. Balsarite, while not strictly necessary, gives a truly solid grab to the Permagloss, and I'd highly recommend it.

Permagloss can't be applied like plastic heat-shrink wraps; to even attempt the same technique will result in frustration. I quickly learned that an iron can't be slid across the surface; the material has a tendency to grab the iron and any movement causes horrendous wrinkles. Per-

haps a linen sock would eliminate this problem.

The best procedure is simply to lay the iron (at about 300°F) over each spot, little by little, until things are attached and shrunk to final level. The excellent instruction sheet provides a lot of insight into the proper application.

A final tip: Permagloss doesn't really attain a good stability on the first shrinking. I found that a second and third shrinking with the iron was necessary. I also found out that once stablility is attained, the stuff lays perfectly, and my tests couldn't bring about any wrinkling. This covering should look great forever.

I like Coverite's Permagloss. Frankly, I've never had a more authentic fabric finish; it's fuel-proof and I didn't touch the spray gun for any additional protection.

PIC 11

The PIC 11 is a rather obscure airplane and was designed at the Finnish Aeronautic College in Helsinki. Several examples have been built by scratch-builders in Finland. It's a favorite subject of mine, but some items on it have defied my modeling abilities (my ¼-scale version has been on the back burner for nearly three years). Arto Hiiva of Lappeenranta, Finland, has successfully modeled the little single-seat sportster in ¼-scale form and it sports a Homelite 1.6 engine. The little bird is quite aerobatic in full-scale and would make a nice stunter for those a bit tired of the many, many Lasers around these days.

Well, it's off to the flying field for now. Next month, full details on the big Byron Aviation Expo. I had a great time—didn't I see you there?

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this column:*

Tru-Turn, c/o Romco Manufacturing Company, Inc., P.O. Box 836, South Houston, TX 77587.

Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60657.

Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

SUNBIRD

(Continued from page 61)

The fuselage is next, and if you thought the wing was easy, the fuselage is just as quick. The fuselage starts with two lengths of lite ply sides reinforced with balsa doublers and stringers. Formers F-1 through F-3 are added, and the tail is joined to form the basic fuselage. Now, for the toughest part, the upper turtledeck.

The turtledeck is merely a couple of half-formers placed on top of the basic fuselage with some light balsa sides and top cap. Refer to the plans for the exact placement of the formers. Once in position, the sides are placed. These are machined to the correct sweep, and angle inward. The top cap is now positioned, completing the turtledeck. Not too bad, huh?

A thick forward deck is placed on the forward top fuselage, followed by bottom sheeting at the rear. Finally, the lower nose sheeting and landing gear blocks are placed and allowed to dry. By the way, when assembling the nose block, you'll notice that this is a beefy part; no doubt, this bird is made for rough treatment.

In the engine compartment (as with the rest of the insides) you'll find plenty of room for all components. The kit furnishes a reinforced-nylon motor mount, and it will accommodate almost any size motor in the .35 to .45 class. For my purposes, I chose the Fox* 40 BBRC Deluxe motor. This is a very compact motor in the .40 class. So much so, that I had to use a long-beam motor mount just to get it to the nose of the ship.

The tailfeathers are the next item. These are sheet balsa parts, however, they are not one-piece assemblies and require some minor assembly. This is most likely done for maximum strength and rigidity.

The tail group can now be joined to the fuselage at this point, the vertical stab

having a long spruce spine to keep it stable. This stab also serves to make a firm mounting, as it extends all the way to the bottom of the fuselage at the tail.

The horizontal stab is quite conventional, with the exception of the split elevator halves for pitch control. For those not familiar with a split elevator, this is the most convenient method to achieve a finely tuned elevator, as both elevator halves can be adjusted separately. For precise maneuvers in the sky, it's the only way to go.

For the most part, that completes the basic airframe on the Sunbird. It will look a bit funny at this point because it's missing a very important part, the canopy. This is one long canopy! But the effect it has on the looks of the Sunbird sets it apart from the rest. Putting a pilot figure underneath it is a must or the bird will look funny.

My choice of a finishing coat was Top Flite* Super MonoKote film. All trim on the bird was also done with MonoKote, and I managed to draw that ever rewarding comment from the local pilots of, "Gee, Mike, what kind of paint did you use?" It's nice to get that every once in awhile.

As I mentioned earlier, the powerplant I used was the Fox 40 BBRC Deluxe motor. I haven't had much experience with a Fox motor since flying control line some 15 years ago. And the little experience I've had was disappointing. But let me tell you, I'm quite impressed with this Fox. This motor is exactly what it's advertised to be. With a 10x6 Master Airscrew prop, the Fox started on the second flip and was idling reliably in less than a minute. The power was more than adequate for the Sunbird, and never skipped a beat.

My Sunbird was guided by a Futaba* FPT-4L Conquest four-channel rig using standard FP-S28/38 servos. This is a common four-channel radio for the sport pilot and it features servo-reversing on all four channels, adjustable sticks, AM transmission, and the rock-solid reputation of Futaba. Performance lived up to the Futaba standards of excellent control at all distances and attitudes.

Ready to fly, the Sunbird weighed 4.5 pounds, with the balance dead on the money. There was only one flaw with the whole setup. This has to do with the Fox spinner, which is an integral part of the motor. This is a very fine spinner, but it's not the correct size for this airframe. The kit called for a 2¼-inch spinner. The Fox is a 2-inch spinner, and no other spinner

will fit...not even another thrust washer! The reason for this is due to the crankshaft machining. It's keyed to the spinner to prevent spinner slippage, and the spinner has keyed slots to match. Consequently, the nose ring on the Sunbird doesn't quite fit the spinner ring of the Fox. This is only an aesthetic flaw, and does not affect performance.

FLYING. The moment of truth for the Sunbird arrived on a bright weekend morning. I had the Fox purring away in no time flat, and then I taxiied her out for her maiden flight.

At half-throttle, the Sunbird rose to the occasion and was airborne in about 75 feet. I throttled up to full power and proceeded to run like mad.

Just for grins and giggles, I let a few other pilots fly her between my first two flights. The first pilot fell in love within two minutes of flying. Another one said it handled really nice.

As for my impression, I thought she was stable, groovy, and a sheer delight to fly. This bird has excellent slow-speed characteristics and just about walks in for a landing. Stalls were about the most gentle I've seen on a low winger in a long time.

The Fox powerplant was plenty of poop for the Sunbird, allowing good size loops and verticals. Throttle response was solid, with good transition throughout the power curve. Given a high-speed prop, this engine will make the Sunbird a real hot-dogging plane.

As mentioned, sport pilots out there are looking for a good bird to have fun with and one that's just enough challenge. I know that many a sport pilot's appetite will be satisfied with the Sunbird. This sport pilot says you can bank on it!

**The following are the addresses of the companies mentioned in this column:*

GM Precision Products, Inc., 510 E. Arrow Hwy., San Dimas, CA 91773.

Satellite City, P.O. Box 836, Simi Valley, CA 93062.

Fox Manufacturing, 5305 Townson Ave., Fort Smith, AR 72901.

Top Flite Models Inc., 2635 S. Wabash Ave., Chicago, IL 60616.

Futaba Corp. of America, 555 W. Victoria, Compton, CA 90220. ■

GOLDEN AGE

(Continued from page 17)

for a lunch break—a golden opportunity for exhibition flying. The American team was featured and a couple of German radio manufacturers demonstrated their systems in sport models. The flying was routine to us, yet greatly admired by the Germans. Kaz and I stuck pretty close to the FAI schedule with some frills added in, while Bob provided the thrills with his low-level passes and such. We averaged two flights per day, with not a thought about maintenance for 4 to 5 days. The only problem encountered was a broken tail wheel joint on the bipe.

The R/C event at the Nats began one morning in a liesurely fashion and was more like a local meet than the Nats. The entrants seemed to enjoy the opportunity to fly more than they did the competition, maybe because the number of entrants was so low. We had a fine opportunity to watch all the models, most of which were cabin styles, and only a few of which had multi-controls. Several were Graupner-kitted versions of the Live Wire Trainer. The flying was quite unlike the world championships; most did their thing and let it go at that. With the low-key atmosphere, it seemed to matter little who was declared the winner, so little in fact, I cannot recall who it was.

From Kassel we traveled nearly the length of Germany again to Baden-Baden, and the home of Germany's model magazine, *Modelflug.* Along the way we visited friends of Dr. Good, who graciously showed us their flying field. I was quite impressed. Imagine a neatly trimmed grass landing area (free of

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GOLDEN AGE

(Continued from page 106)

obstructions) situated atop a 1,500-foot hill and overlooking a quaint old village—no wonder German modelers love gliders!

The *Modelflug* offices were interesting, and they were happy to see and hear about American R/C.

We traveled further south to Strassburg, and were shown yet another scenic hilltop. What a beautiful sight to see sailplanes soaring on the thermals above the historic buildings of Strassburg.

The first American FAI R/C team certainly left quite an impression on the world of German modeling. And, in turn, we were deeply impressed by the German country and people.

Back in the U.S., when proportional arrived, the seeds of R/C were planted; the full potential of the ultimate control system was borne of these proportional seeds. Even so, modern proportional radios didn't just happen overnight, it took years to develop what we have today.

Reader correspondence has brought more information that I'm sure you all will appreciate. I've had extensive communication with Bill Weaver of Middletown, Maryland, and he tells of a real early bird and his continued devotion to R/C. Bill is a long-time member of the Frederick, Maryland, Model Airplane Club, which apparently has a very serene hilltop flying site. Bill is a master modeler/mechanic with a life-long dedication to modeling.

Bill is set apart by the fact that he has diligently retained his models throughout the years. As an example, his L.W. Trainer was first flown in 1952; it's still flying 35 years later! When he goes on to a newer model, he simply hangs the previous one up, and waits. He advanced from the Trainer to an L.W. Senior, which is also still flying.

Bill recently looked into electric power to see what it was all about. In searching for a suitable test plane he noted that the Trainer suited his needs. So instead of having to build something new, old reliable is flying once again, this time with electrical power—something never dreamed of in 1952! Old birds also make excellent trial ships for engines; the Senior is allowing Bill to get aquainted with a four-cycle, and now flies with an O.S. .40 four-stroke.

Bill's point: use a model in storage. Find out if you like the new equipment; you'll have more modeling time and the old birds can have a new life.

Another point comes from Lynn Fondots of Boyertown, Pennsylvania. Lynn is another one of the reincarnated OTers. Our recent Smog Hog discussion reminded him of his start in 1956. He went on to a Champion, a Spirit, and a Charger, before entering the military in 1963. Twenty years later, he's back into modeling and marveling at today's radios and goodies.

These days he finds it difficult to attain originality. Thinking back, he recalls earlier designs which sported good looks and had unique appearances. He's trying to model something unique and has been searching for plans and/or kits. So far, he's found the Sonic Cruiser, Perigee, and Viscount; also, Kaz's Orion and Taurus. He's still looking for the Stormer, Voltswagon, and Interceptor, among others.

(Continued on page 112)

GOLDEN AGE

(Continued from page 108)

Can anyone help Lynn along?

Lynn tells of a recent experience with an Astro Hog, which exemplifies his thinking; he applauds Sig for kitting it. Lynn powers his Astro with an O.S. .60 four-stroke, which seems a likely combination. He's astounded by the docile flight characteristics. Two of his friends who are newcomers to R/C also enjoy Astros as their first low-wingers.

In another instance, he handed his Astro and transmitter to a bystander, who proceeded to make several circuits of the field (without help) in his first R/C effort. If I can add my two cents' worth; a club buddy once asked me to test fly his new Astro Hog: he never got his hands on the transmitter the entire day!

Besides those already into OT R/C, Lynn feels there's a great underlying interest, but these fine designs suffer from a lack of exposure to the "new generation" R/Cer. Both *Model Airplane News* and "Golden Age" are doing their best to alleviate this problem.

The stage is set for the proportional revolution, we'll be getting into that the next time around. Why don't you join in with OT R/C?

Hal "Pappy" deBolt, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

THUNDERBOLT

(Continued from page 26)

Next, pin the hatch assembly down to the building board along with the rear deck. At this point, glue the stab into position. Mark the positions of the longerons onto the rear deck and glue them in place. Install the two bulkheads and the firewall. Now, position the fuselage sides and glue them in place. Add the basswood crossbraces and the trailing edge stock firewall supports. Install the elevator control linkage, followed by the bottom sheeting. Finally, install the fin and dorsal in place.

Install the servos in the wing before gluing the wing to the fuse. Be sure to fuel-proof the firewall and tank area with epoxy. The remainder of the internal equipment can now be installed, working through the hatch opening. After a thorough sanding, cover the plane with the material of your choice. Before flying, give the plane a good pre-flight check.

FLYING. Be warned, the Thunderbolt is definitely a hot airplane; its high speed, quick responsiveness, and small size add up to a real handful at first. Once you become accustomed to this performance, however, you'll find that these traits make it a real joy to fly. The ship exhibits neutral stability, that is to say, it goes exactly where it's pointed and will continue that way until you change it. Keep "on the stick" and stay one step ahead of the plane or it can quickly get away from you.

Hand-launching a low-wing airplane can be a bit tricky. The best technique is to grab the fuselage just ahead of the wing with the engine running at full rpm, and give the Thunderbolt a smooth push at a 10° upward angle. The prop will grab quickly, and the plane will rapidly accelerate and climb out nicely.

Once aloft, the plane will do just about any maneuver you want. The vertical penetration is excellent, and the roll rate is nothing less than spectacular. Loops, hammerheads, split-S maneuvers—you name it—they're all a breeze with this little rocket! Your friends will be amazed to see the Thunderbolt outperform their "big" planes.

Landing is no big deal. One method is to let the plane run out of gas and dead-

THUNDERBOLT

stick it in to a belly landing. This usually works out well, but it can sometimes leave you in a tough spot when the engine quits. It's also possible to leave the power on through a normal landing pattern, but be sure to cut the engine just before touchdown or you run the risk of breaking the propeller. Either way, it's important to keep the speed up during the landing procedure in order to maintain good control response.

Whatever your cup of tea, aerobatics, pylon racing, combat, or just tearing up the skies, the Thunderbolt offers big performance in a convenient size. ■

PATTERN

(Continued from page 80)

good shape. Next, as the gasses accelerate outward, they manage to pull some of the fresh, incoming fuel and air out of the engine through the exhaust port with it. Sounds pretty bad so far, but remember by this time the gasses start to decelerate at the rear of the chamber. At the point of deceleration, the gasses bounce off of the rear of the chamber, much like the ripples in water as they hit the sides of the shores. This returning wave of exhaust gasses hits the oncoming wall of fresh fuel/air pulled out of the motor. The pressure is still very high, forcing the fresh fuel/air to back-up. It backs-up right back to the combustion chamber of the motor, but not down the intake port. The engine has rotated past the intake port opening, thus forcing the fuel/air in the exhaust pipe to be packed very densely into the combustion chamber. The exhaust port now closes, and combustion takes place, the result being a much more powerful detonation due to a highly condensed fuel/air mixture now in the chamber. The effect is known as supercharging.

For the most part, all you have to know is that when you put that pipe on the plane, you are going to get a power boost, depending on where the high point of the pipe is located. For most of us with the .60 motors, anywhere from 16 to 12.5 inches will work. But here is where a bit of trial and error is required.

You must remember the rule of thumb, the shorter the pipe length, the higher the rpm must be in order for the supercharging to be effective. For high-speed flight, use a short pipe and small prop. For more normal flight, but higher torque, use a longer pipe and increase the size of the prop. Okay, let's say that you have the pipe on there and just want to tune it in.

To tune it in, you need a tachometer, a pipe cutter, and some props of the size you intend on using. Say, we're shooting for lots of rpm for speed.

With the engine and pipe mounted, measure the distance from the glow plug to the thickest portion of the pipe, the very forward edge of this portion. Include the full distance along the header and coupler. Let's say we measured 13.5 inches. The prop we're using is a Zinger 10.75x7.5. With the motor running, take a tach reading at full power. Say we read 13,000 rpm. Now, cut off a quarter inch of the header. (Not the pipe, the header.)

Once done, put it back together again and take another reading. The engine should pick up some rpm. By the way, watch the way the needle valve adjusts to the touch. The needle valve will give you the first clue to the pipe setting. The needle should not be sensitive to set. If the

(Continued on page 118)

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to **Model Airplane News,** Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

The Boeing XL-15, an Army Ground Forces' versatile liaison airplane, was a package unit which could be towed up to 40 mph and was capable of being "knocked down." By removing the wings and tail surfaces and latching them down to the sides of the fuselage, the XL-15 could be moved about readily on its own wheels. The compact package could be hidden among the trees or otherwise stored away when not in use, but could be reassembled and ready for flight in less than an hour.

Congratulations to Douglas Cumins (age 10) of Camarillo, California, for correctly identifying September 1987's mystery aircraft. Other correct entries were received from Earl Lock of Tallmadge, Ohio, and Bill Ferguson of Port Angeles, Washington.

PATTERN

(Continued from page 116)

rpm increased a bit and the needle stayed pretty easy to set, go ahead and cut off another quarter inch of header Each time you do, remeasure the rpm and the needle. As the pipe gets shorter, the rpm should increase, and the needle will get more sensitive. The moment the rpm fails to increase on the newly cut header, then you have reached maximum boost and should stop. By now, the rpm should be about 14,000, depending on the fuel, engine, and other variables. But you get the idea with this sequence.

What happens in the air? With the bird flying, listen carefully to the sound of the motor. The ship should pull well, and when pulled vertically, the engine should sound the same with no sagging or loss of rpm. If you lose rpm, the pipe may be too short or the prop too large. We started with a fairly small prop, so we would change the pipe setting longer, one-quarter inch at a time. The stopping point is when the engine can hold a steady rpm in all attitudes of flight.

You can change the prop as well, providing you started with a fairly normal size prop, like an 11x7 or 11x8. By changing the prop size until the rpm stays steady, you can achieve better flight performance, sometimes. The result would be an aircraft that climbs much better while still having plenty of punch in the straight and level portions. Once you are satisfied with the engine performance, leave everything alone. Stay with the same prop, same pipe length, and same fuel. A change to any one will change the way the engine performs. Keep working with it, and you'll end up with a really satisfying aircraft.

Our final tidbits of news this month start out with news of the famous big contest of all time, the Circus-Circus Tournament of Champions. We have it that Mr. Bill Bennett of Circus-Circus will once again hold the TOC at Las Vegas in 1988. The prize purse offered totals about $100,000. Rules for qualifying will be brought to you as soon as we get them, but rest assured, this will be the best battle in pattern anywhere on earth.

Our congratulations to Chip Hyde, Tony Frakowiak, and Steve Helms, who are the top three finishers in the U.S. Masters Tournament. These three pilots will represent the U.S. in France for the

Club of the Month

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by the club to outstanding members. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

Located in north central New York state, just west of Lake Ontario, the Thousand Islands R/C modelers are our pick this month. The club has approximately 30 members and they openly welcome, "anyone with an interest in any aspect of radio control." This includes cars and boats, a refreshing change from more closed clubs around the nation. The flying field is in Limerick, New York, where the club is investigating purchasing the land that surrounds the field.

This New York group has a most informative newsletter, called *Limerick Lines*, which features club-generated material as well as pickups from other R/C club newsletters. A recent issue included an engine article, a humorous piece, frequency problems explained, and more frequency discussions by Tom Runge of Ace R/C. It all is most readable and I am sure of great value to the membership. It appears *Limerick Lines* is put together by club secretary Bob Wood.

Very shortly the local TV station will be filming flight activities of the club for use at the station as filler; a nice public relations piece for the Thousand Island modelers. Steve Dillenback is club prexy with John Mosher, veep, and Tom Campagnano, treasurer. They can be proud of their group that presents such an obvious warm and friendly approach.

We at *Model Airplane News* wish the Thousand Islanders the best in all their future activities and we are pleased to award two free one-year subscriptions to be given by them to worthy members.

Congratulations!

PATTERN

Worlds Champs. We'll keep you posted on the final results as soon as we hear of them.

Lastly, I've gotten a lot of feedback on the article in our July issue, which featured aircraft made by the Ten Plus Company. Many of you have asked about the planes and the quality of them. Stay tuned and we'll let you see one up close; we have one on order. For now, just let me say that Merle Hyde (Chip's father) says they're built just the way he would build one...and this guy is picky! We'll see. Till then, we're on the pipe and airborne.

Mike Lee, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

HELICOPTER

(Continued from page 51)

Differential travel can be an advantage on the tail rotor linkage if the differential is working in your favor. At this time, we're trying to keep the setup simple, so try to be sure that there is no mechanical differential in the tail rotor linkage. If the linkage is shifted to one side or the other, correct the shift by removing the arm from the servo and replacing it on the servo in a location which is either straight up or straight down (perpendicular to the servo centerline).

Be sure that the tail rotor system is working in the proper direction before attempting to fly the helicopter. Since you've had the servo arm off, it's wise to recheck the throw. Next, follow the tail rotor pitch control linkage all the way along its path to the rear bellcrank. The rear bellcrank is the opposite connection for the linkage. It's possible to also have differential in this connection. To eliminate any differential at this point, be sure that the arm of the bellcrank which connects to the linkage from the servo is perfectly in line with the output shaft of the tail rotor transmission and the servo in the neutral position.

The tail rotor linkage needs to be free of slop, but have no binding. Getting the linkage to this point requires careful inspection. Fix any bind or slop that you encounter. Continue by adjusting the tail rotor pitch to the approximate angle recommended by the kit manufacturer, unless you're familiar with the exact

(Continued on page 122)

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory.** The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

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R/C Airplanes, helicopters and cars. Ready to run kits. O.S., Enya, Sig, rockets, plastic models, paint tools and supplies. Open 7 days, 11-8.

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Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Owner: John Eaton.

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15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two-and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.

BRISTOL HOBBY CENTER
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Connecticut's leading R/C shop, 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.

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54 Chesnut Hill Rd. **846-9090**

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R/C, airplanes, boats, cars, trains, rockets, games, plastic models, paint, tools and supplies, new and used. Open daily Mon.-Fri. 10:30-6; Sat. 10:30-4.

CARL WILSON'S CLEAR TRACK LTD.
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When in Disney World, stop and see a complete line of R/C planes, boats, cars, rockets, and accessories.

BOB'S HOBBY CENTER, INC.
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ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.

STANTON HOBBY SHOP, INC.
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EL HOBBY SHOP
Centro Commercial, San Jose 2000
Apartado 529, Centro Colon **32-26-81**

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Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 632 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Mary Hennessy.

HELICOPTER

(Continued from page 119)

location of the normal neutral point for your particular helicopter. The next step is flight adjustment, which I'll cover in-depth next month. In the meantime, keep pounding away at that perfect machine.

New Products

The first item is the new Boom Saver from North-Bilt Products*, designed by Dick Northam to prevent damage to the tail boom in the event of a boom strike caused by a hard landing. It's perfect for the beginner (or even the expert) practicing autorotations. I've installed my Boom Saver on my Baron 50.

The next item comes from Miniature Aircraft USA*. Miniature Aircraft manufactures the Rotorsport line of replacement rotor blades. The people at Miniature Aircraft have recognized there is a tendency when using weighted rotor blades for the blade holders to fail. In answer to this problem, Miniature Aircraft has developed molded urethane blade mounts which now come standard with all Rotorsport blade kits. Miniature Aircraft is offering to replace any set of Rotorsport blades with the wooden blade holders for a nominal fee of $2. Send your blades to Miniature Aircraft, new or used, as long as they're undamaged. Next time, photos and a review of these new blades.

Craig Hath, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this column:*

North-Bilt Products, 5325 W. Jackson St., Indianapolis, IN 46241.

Miniature Aircraft USA, 2324 North Orange Blossom, Orlando, FL 32804. ■

Classified

RAZOR BLADES: Single-edge industrial quality, super sharp. 100/$4.75, 200/$9.50, 300/$14.25, 500/$23.50, 1,000/$46.00; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

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HARRY HIGLEY BOOKS: *There Are No Secrets*—on finishing model aircraft, including paints, adhesives, heat-shrink plastics, shaping, sanding, priming, etc. *Master Modeling*—explains drawing plans, how to scratch-build, use plastics, foam, fiberglass, balsa, and plywood. *Tom's Techniques*—from Tom Ingram, in collaboration with Higley, explains all aspects of finishing a model airplane with iron-on plastic films, step-by-step photos. Special clearance price due to discontinuation of Harry Higley's book line. All books are reduced to $8.95 each (down from $10.95), plus $1.50 postage each. Quantities are limited so act today. *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

ENGINE COLLECTORS: Spark ignition and old diesels for sale. Riccardo Taccani, CP59, 6834 Morbio INF Switzerland.

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WANTED: Model engines made before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; 806-622-1657.

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COMING EVENT: 4th Annual Carolina Model & Hobby Expo; static show and swap shop; November 28-29, 1987—Charlotte Merchandise Mart, 2500 E. Independence, Charlotte, NC—1st and 2nd place trophies in 26 categories. Admission $3.00, ages 6-12 $1.00, no entry fee for static competition. R/C aircraft, CL aircraft, ships, boats, cars, trains. Contact: Carolina Hobby Expo, 3452 Odell School Rd., Concord, NC 28025; (704) 786-8373.

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WANTED: Berkeley and Cleveland kits. Will also consider parts, plans, boxes, brochures, radio equipment, accessories, etc. Gordon Blume, 4649 191st Ave. SE, Issaquah, WA 98027.

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CLEARANCE SALE ON COVERING VIDEO: *Model Airplane News* has available a few copies of this hour-long, professionally produced, instructional video cassette on envelope covering by Dick Phillips. For beginner or expert, regardless of size of plane. Ideal for clubs and hobby shops, too. BETA cassettes only available. Each cassette is $19.95 (below cost, they're reg. $39.95), plus $3.00 postage and handling. Send order and payment to *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

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